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A Revision of the Nearctic Species of Fanniinae (Diptera: Muscidae)

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THE CANADIAN ENTOMOLOGIST

Supplement 14

Accompanies Volume XCII

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by

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A Revision of the Nearctic Species of Fanniinae (Diptera: Muscidae)[1]

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INTRODUCTION

The subfamily Fanniinae is considered by present-day workers to include six genera, five of which are now known from North America. *Fannia* R.-D., the main genus, includes at the present time almost 200 known species. The other four contain only a few species, with one each in *Platycoenosia* Strobl and *Piezura* Rondani, three in *Coelomyia* Haliday, and seven in *Euryomma* Stein. In this revision, 46 species of *Fannia*, and one each of *Euryomma* and *Piezura* are described as new.

The present study is concerned with all the species of the subfamily that occur in the Nearctic region, which is here interpreted as extending throughout North America south to the limits of the Mexican Plateau. This southern limit is by no means sharply defined, however, and the Mexican species generally show affinities with Central and South American groups.

The number of correctly identified species previously known from the region is 45, of which 19 were known to be Holarctic. This paper brings the total to 105 by the inclusion of 48 new to science and another 12 new to the region.

The North American species of the genus *Fannia* have been divided into 18 groups and subgroups, based largely on adult morphology (especially of the genitalic structures), but also, so far as was possible with limited data, on the immature stages as well. A tentative phylogeny has been postulated, and evolutionary trends outlined. Biological and distributional data have been compiled from the literature and from the material seen by the author.

COLLECTIONS STUDIED AND METHODS

The present study is based on approximately 7500 specimens which were made available to me by the following 35 museums and individuals: American Museum of Natural History, New York (A.M.N.H.), C. H. Curran; California Academy of Sciences, San Francisco, E. L. Kessel; California Department of Public Health, Berkeley, B. Keh; University of California, Davis, A. T. McClay; University of California, Los Angeles, J. N. Belkin; University of California, Riverside, P. H. Timberlake; Chicago Natural History Museum, H. Dybas; Canadian National Collection of Insects (C.N.C.), Ottawa; Colorado A. and M. College, Fort Collins, T. O. Thatcher; Communicable Disease Centre, Atlanta, Georgia, H. D. Pratt and H. R. Dodge; Cornell University, Ithaca, N.Y., H. Dietrich; State Plant Board of Florida, Gainesville, H. V. Weems Jr.; Illinois Natural History Survey, Urbana, M. W. Sanderson and H. H. Ross; Indiana University, Bloomington, F. N. Young; Iowa State College, Ames, J. L. Laffoon; Kansas State College, Manhattan, H. E. Evans; University of Kansas, Lawrence (Snow Entomological Museum), R. H. Beamer and G. W. Byers; University of Massachusetts, Amherst, C. P. Alexander and M. E. Smith; University of Minnesota, St. Paul, E. F. Cook; Museum of Comparative Zoology, Cambridge, Massachusetts, P. J. Darlington Jr.; University of Nebraska, Lincoln, L. W. Quate;

[1]Based on a thesis submitted in partial fulfilment of the requirements for a Ph.D. degree at the University of Kansas, May, 1958.

University of New Hampshire, Durham, J. F. Conklin; Oklahoma A. and M. College, Stillwater, F. A. Fenton; Oregon State College, Corvallis, W. P. Stephen; Royal Ontario Museum, Toronto, G. G. Wiggins; Academy of Natural Sciences of Philadelphia, H. J. Grant Jr.; Purdue University, Lafayette, Indiana, G. E. Gould; School of Tropical and Preventive Medicine, Loma Linda, California, R. E. Ryckman and R. D. Lee; South Dakota State College, College Station, W. M. Rogoff; University of Tennessee, Knoxville, H. F. Howden; United States National Museum, Washington (U.S.N.M.), C. W. Sabrosky; Utah State College, Logan, G. F. Knowlton; State College of Washington, Pullman, M. T. James; University of Wisconsin, Madison, C. L. Fluke; University of Wyoming, Laramie, W. D. Fronk.

All of Malloch's types have been examined by me at the museums where they are deposited (except for the type of *nidicola*, which has been lost). Stein's types, located in the Zoologisches Museum, Berlin, Germany, could not be examined, although cotype material for most species was examined at the Chicago Museum of Natural History. Further details are supplied under the systematic treatment of each species. The disposition of type material of new species described in this paper is indicated after the description. The greater part of the material is deposited in the Canadian National Collection of Insects, the U.S. National Museum, and the Snow Entomological Museum, University of Kansas.

Specimens were studied and identified from external examination alone, except where genitalic dissection of a few specimens (usually two or three of each sex of a species) was necessary to establish relationships and provide material for illustration. Gross male genitalic structure was usually visible externally and could be used to verify identification by chaetotactic characters. Specimens were examined under a light screened by a blue filter at magnifications of approximately 60× and 115×, and measurements were made by means of a grid (reticule) whose lines under the higher power were 0.1 mm. apart. Thoracic markings are described as seen from the front and abdominal markings as seen from behind.

For the study of male and female genitalia the specimens were relaxed and the tips of the abdomens were clipped off (usually at the end of the third segment) with a pair of minute scissors. This usually left two segments in good condition to show color and pollinosity, and there was no danger of damaging the genitalic complex. The tip of the abdomen was then dropped in a small dish containing cold 10 per cent KOH solution, which was intermittently heated by a 100-watt bulb placed just above the dish. The heat applied in this manner was not sufficient to boil the KOH, and permitted more careful control of the maceration process. From one to three hours was usually sufficient to clear the structure to the desired extent. The specimen was then dipped in acetic acid, and placed in a shallow dish of glycerine for further dissection and examination. After examination the genitalia were placed in a microvial containing glycerine.

Drawings were made using a squared ocular grid and squared paper at a magnification of 115×, so that the final magnification of the drawing was approximately 250×, which is reduced in the published drawings to approximately 60×.

Descriptions have been so organized that only the diagnostic features within any one group are given in the specific description. In the same way the group (or subgroup) descriptions list only the characters variable within the genus. In this way, the author has endeavored to stress the important characters at each

level. The entire description of any one species can be obtained by a systematic compilation of characters from the specific to the subfamily descriptions.

The terminology used is that of Curran (1934), except for the genitalic terms which are taken from Chillcott (1958a). "Mid" is used throughout with reference to the middle or second leg, while medial, median, or discal is used with reference to the middle part of a structure. The use of abbreviations for the more important structures and bristles, particularly the legs and leg bristles, has been generally accepted by workers on Muscidae, and is adopted here in the descriptions for the sake of brevity.

HISTORICAL REVIEW

General Classification

The genus *Fannia* was proposed by Robineau-Desvoidy in 1830 to contain the single species *saltatrix* (= *scalaris*). At the same time, he erected *Philinta*, containing the species *canicularis, pallipes* (= *canicularis*), *testacea* (?= *pretiosa*) and *flava* (*Pegomyia*); and *Aminta* containing *ludibunda* (?= *incisurata*), *grisea* (=*pruinosa*), *brunipennis* (= *mutica*), *rivularis* (species dubium) and *floralis* (= *serena*). All species except *canicularis* were described as new. He also recognized the close relationship of the three genera.

In 1834 Bouché erected the genus *Homalomyia* with *canicularis* as the type, and *scalaris* and *macrophthalma* (?= *genualis*) as the two other included species. He noted the long lateral filaments of the larvae among other distinguishing characters.

Macquart (1835) placed all the above in *Anthomyia*, but grouped *manicata, armata*, and *ornata* with *scalaris* under *Fannia* (as a subgenus?) without distinctly recognizing the other Robineau-Desvoidy genera. Haliday (1837) listed several more species in *Fannia* and considered *Philinta* insufficiently distinct to deserve generic status.

Westwood (1840) considered *Homalomyia* a distinct genus from *Anthomyia*, and included within it *Fannia, Philinta*, and *Delia;* and, in a footnote, Haliday concurred and also included *Aminta*.

Throughout the rest of the nineteenth century, authors such as Schiner, Rondani, Loew, and Stein continued to use *Homalomyia*, treating *Fannia* (or *Faunia*) and the other genera as synonyms or subgenera.

Haliday (in Westwood, 1840) described the genus *Coelomyia* with *mollissima* as type, on the basis of the obovate, ventrally membranous abdomen and produced oral margin. Schiner and Rondani considered *Coelomyia* a synonym of *Homalomyia*. Bigot (1882) listed three genera: *Homalomyia, Faunia*, and *Parmalomyia* (= *Coelomyia* Hal.).

Piezura was erected in 1866 by Rondani with *pardalina* (= *graminicola* Zett.) as type, and in 1894 *Platycoenosia* was erected by Strobl for a new species, *mikii*.

In 1895 Stein published a large paper on "Die Anthomyiden-gruppe *Homalomyia*", which begins with a very detailed description of the group and emphasizes all the important diagnostic characters except the arrangement of the anal veins of the wing. He treated *Homalomyia, Coelomyia*, and *Piezura* as distinct genera, and placed in the genus *Fannia*, with excellent descriptions and synonymy, 26 previously described species and 16 described as new. He also described *Choristomma pokornyi*, new genus and species, not realizing that the taxon had already been described by Strobl under the name *Platycoenosia mikii*.

Van der Wulp (1896), apparently for the first time, noted as a generic character for *Homalomyia* the arrangement of the anal veins, the primary group character used today.

In 1899, Stein described the genus *Euryomma* and in 1907, in the anthomyiid section of his Palaearctic catalogue, synonymized *Choristomma* with *Platycoenosia* and *Homalomyia* with *Fannia*. The basic classification has remained virtually unchanged to date. With the publication of the catalogue, *Homalomyia* dropped out of common usage and the genera that have since been split off from *Fannia* (*Beckerinella*, *Steinomyia*, *Ivalomyia*, etc.) have generally been relegated to synonymy by later workers.

The formalizing of Stein's "*Homalomyia* group" was effected by Verrall in 1901, when he listed *Homalomyia*, *Piezura*, *Coelomyia*, and *Azelia* under the subfamily Homalomyinae, family Anthomyiidae. Schnabl and Dziedzicki (1911) erected the "Formenreihe Muscinae fanniaeformes vel Homalomyidae", placing under this category two families, Fanniinae (with the five genera recognized by Stein) and Azelinae (with *Azelia*).

Since then the fanniines have been given subfamily or tribal (Karl, 1928) rank, with *Azelia* occasionally included but more frequently given separate status. Van Emden (1941) treated the group as a subfamily of the Muscidae, and introduced the true dorsal position of the hind-tibial bristle as a further diagnostic character for the subfamily. Roback (1954) raised the group to family rank, mainly on the basis of larval characters. Hennig (1955) continued to treat it as a subfamily.

Nearctic Faunal Records

The first reference to the subfamily in North America was that of Walsh in 1869, although Wiedemann (1830), Walker (1849), and Thompson (1868) had described species in *Anthomyia* which were later transferred to *Fannia*. Walsh described three species in the genus *Homalomyia* (= *Fannia*), but unfortunately the descriptions are short and are based largely on the larvae. Only one of the species, *prunivora* Walsh (= *canicularis* L.), of which the adult was described, can be positively identified.

In 1872, Loew described two more species of *Homalomyia*, both of which were later relegated to synonymy.

In 1881, Hagen published a revised list of the Anthomyiidae identified by Meade from North America (original list, Meade, 1878) and included additional records based on Loew's collection. This brought the recognized species to nine (excluding Walsh's species).

In 1885, Bigot described three new species, all of which were later relegated to synonymy.

In 1897, Stein published the first comprehensive taxonomic work on North American Anthomyiidae, with a key to 14 species of *Homalomyia* and detailed descriptions of 17, seven of which were new species and another four were new records. In addition, *Choristomma pokornyi* was recorded for the first time.

In 1900, Coquillett described one species, *H. flavivaria*, which was later synonymized with *Coelomyia subpellucens* Zetterstedt.

From this time until the 1950's only two workers, J. R. Malloch and P. Stein, were active in the taxonomy of this group. In 1920, Stein described three new species and listed one new record in the genus *Fannia* and also recorded *Euryomma peregrinum* from North America. Malloch from 1912 to 1927 described 14 new species, and recognized ten species new to the region. His most

important papers were two of 1924, including keys to the males and females of North American species of *Fannia*. If the two valid species described in 1927 are excepted, this serves as a full list of the North American species of *Fannia* known before 1950; these total 42, of which 22 are strictly Nearctic. There were, however, several misidentifications.

The subfamily then remained virtually unstudied, until Dodge (1951) recorded *Fannia difficilis* from Massachusetts. Seago (1953) described *F. enotahensis* as new, and in 1954 revised the *pusio* group (including *punctiventris*), describing three new species (only one is Nearctic) and giving brief descriptions and distributional notes on six others.

DIAGNOSTIC CHARACTERS AND THEIR VARIATION WITHIN THE SUBFAMILY

Adults

Sexual dimorphism in the Fanniinae is, as in most muscids, well-developed. The males exhibit a variety of secondary sexual characters, whereas the females remain relatively primitive and follow parallel rather than divergent morphological trends. This dimorphism is most apparent in the head, abdomen, and legs, the thorax and wings being almost unaffected. Hence the thorax provides the main characters for associating the sexes, the additional characters being chosen from the most stable features in leg and head structure and chaetotaxy.

Chaetotaxy provides the majority of characters used in defining groups and separating species. The number and arrangement of bristles are amazingly constant within species, and considerably variable between species for all external structures except the abdomen. Structure other than chaetotaxy is of greater importance at the group level, with differences in the parafrontals, proboscis, femora, and male and female genitalia.

Head.—(Figs. A, C, p. 15) The head is fairly stable, the eyes as seen in profile occupying most of the surface, and the frons, parafacials, and genae being at most one-eighth as wide as the vertical diameter of the eyes. The oral margin scarcely projects except in *Coelomyia*, in which there is a slight prognathous appearance. The postoccipital surface is plain or slightly concave.

The chaetotaxy of these surfaces varies only slightly. The eyes vary from completely bare, the typical condition, to finely but distinctly pubescent as in several species of the *lugubrina* and *hirticeps* groups. The parafacials are bare except in the females and a few males of the *canicularis* and *benjamini* groups, which have fine, irregular setulae (distinct bristles in *binotata*) on the upper halves next to the antennae. The row of occipital bristles varies somewhat in bristle length and evenness from species to species. The postoccipital surface is typically bare on the dorsal half but was primitively haired, and the more primitive species in several groups have one or two irregular rows of hairs extending more or less to the vertex. Since this character is not affected by sexual dimorphism, it is valuable in associating the sexes.

The frontal surface of the head varies the most between groups and between species, and deserves detailed consideration. Males are typically almost holoptic and the females distinctly dichoptic, yet in the primitive species, particularly in the genera *Euryomma* and *Platycoenosia* and in the *Fannia glaucescens* subgroup, the primitive dichoptic condition persists in the male. In advanced species of the *fuscula* subgroup there appears to be a secondary disappearance of sexual dimorphism, the female frons becoming narrower and the male frons broader.

In typical males the parafrontals are very narrow and are separated by a linear frontal vitta. Their width and the extent they broaden toward the antennae are important specific characters (given in this paper as widths in millimeters just in front of the ocellar triangle and again opposite the anterior frontal bristle). Each parafrontal bears on the inner margin a row of two to 14 frontal bristles, with some irregularity in length and strength when many bristles are present. There are typically no parafrontal setulae between the frontal bristles and the eye. The orbital bristles are typically absent, but the upper orbital is characteristically present in the males of the *canicularis* group (although not apparent in the *pusio* subgroup) and in *Piezura*, whereas both orbitals are present (and the parafrontals correspondingly broad) in *Euryomma* and *Platycoenosia*.

In the females, the parafrontals are broad, usually one-third to one-half as broad as long (the length measured from the posterior orbital bristles to the first (anterior) frontal bristle) and typically convex on the inner margin. The frontal vitta is distinct, usually as broad as or slightly broader than either parafrontal. The variation in width and degree of convexity of the parafrontals is of considerable taxonomic value, particularly at the group level. The pollinosity of the parafrontals varies from none (the surface a glossy black) to heavily pollinose, and provides both group and specific characters.

Both orbital bristles, as well as six to eight rather weak frontal bristles, are present in all females. The parafrontal setulae are also useful taxonomically. Typically there is an even row extending from the upper orbital to the anterior margin, but in some species there may be as many as four irregular rows below the lower orbital, with several scattered setulae between the orbitals.

Mouth parts (Figs. 262-270).—The mouth parts are typically unmodified, but in a few cases are sufficiently distinctive to give reliable group characters. They are unusually affected by sexual dimorphism in some groups, in that the females only have modified structure. The theca is normally pollinose and weakly sclerotized, but becomes swollen and somewhat elongate in *Coelomyia;* slender, glossy, well sclerotized, and distinctly elongate in the *Fannia lugubrina* group; and short, swollen, and glossy in the females of the *carbonaria*, *postica*, and *serena* groups. The palpi are typically linear and as long as the theca, but there are three species in widely separated groups with strongly spatulate palpi, whereas in the *minutipalpis* subgroup the species have short, reduced palpi. The number of pseudotracheae in the labium varies from eight to 14, the larger number being typical, with reduction in the *postica* and *lugubrina* groups.

Antennae.—The antennae have the normal muscid shape: the first two segments short, the second typically with one strong and several weak dorsal bristles. The third is typically twice as long as broad, with only minor differences in proportions in a few species. The arista is typically slender, only faintly thickened basally, and with very short pubescence. In *Coelomyia*, several species of *Euryomma*, and a few species of *Fannia* the pubescence is distinct; in *Piezura* the arista is short-plumose and in *Platycoenosia* long-plumose.

Thorax (Figs. B, D).—The structure of the thorax appears to be stable, with little or no variation in the size and shape of the sclerites. Hence all the thoracic characters are based on chaetotaxy and pollinosity.

The mesonotum bears two to four rows of acrostical (acr.) setae, the inner rows, when present, rather irregularly arranged. In the *canicularis* group there are three to four rows; in the *benjamini* and *pusio* subgroups they are evenly triserial; and in many species of the *postica*, *serena*, *lugubrina*, and *hirticeps* groups they are uniformly biserial. The bristling of the mesonotum is constant

throughout the subfamily with two presutural and three postsutural dorsocentrals (dsc.), two sublaterals, two humerals, two intraalars (ia.), one supraalar, and two postalars. The accessory setulae, however, vary in strength and number. Primitively numerous and weak, in most species groups they have become reduced and differentiated. This trend, with the consequent development of the prealar bristles from the lateral accessory setulae, is visible in the *scalaris* group. The lateral extent of the setulae near the intraalar bristles and the number and strength of the prealar bristles are important at both the group and specific levels. In a few species the prealar bristle is absent.

The propleuron is bare except in *difficilis* and *variabilis*, in which there may be as many as a dozen setulae present. The stigmatal bristles, situated directly below the anterior spiracle on a slight elevation, frequently have several setulae at their bases, and the presence or absence of these setulae is important as a specific character. The mesopleural bristling is similarly important. The distribution of the setulae varies within rather narrow limits, but there is frequently some differentiation of the dorsal row of setulae to form bristles. The sternopleural bristles are consistently two in number, with a lower median bristle occasionally faintly developed. The extent of the accessory setulae is not particularly valuable as a character. However, a strong sternopleural thorn (actually a fusion of several bristles) (Fig. 229) appears on the midventral surface in several species of the *scalaris* group, as a result of the development and fusion of the bristlelike setulae in that area. The pteropleural and hypopleural areas are invariably bare.

The scutellum normally bears two pairs of strong and one or two pairs of weak marginal bristles, a pair of weak preapical discal bristles, and one or two rows of lateral accessory setulae. The extent of the accessory setulae serves to distinguish a few species.

The squamae provide good group characters, and, more rarely, good specific characters. The squamae are typically subequal, the lower lobe projecting somewhat due to its more posterior attachment. In some members of the *postica* group the lower squama is reduced to a small lobe; in the *serena* group it becomes completely linear. The reverse tendency occurs in the *setifer* subgroup, where the lower squama is in the form of a distinctly projecting triangular lobe.

The wings and halteres are essentially constant in structure, with only minor and mainly intraspecific variations in wing venation. Along with the squamae, the wings and halteres of the males exhibit considerable interspecific color variation, from a dark brown through clear yellow to a rather clear colorless state. Except for some species of the *carbonaria* group the females have these structures clear or pale yellow.

Abdomen.—The abdomen (excluding the genitalic segments) is fairly constant in general structure, although with some variation in proportions. Typically the width is to the length as 3 : 5, but is sometimes as 1 : 2, and may become as extreme as 2 : 5, in the elongate species *arcuata*. In all members of the genus *Fannia* the abdomen is broadest at the posterior margin of the second segment. In *Coelomyia*, however, the abdomen is broadest at the apex of the fourth segment, giving it a spatulate appearance. In all but a few species the hypopygium is small and inconspicuous.

There are typically five distinct segments in the male abdomen, the sixth to eighth forming a composite pregenital "segment" around the base of the hypopygium. The color of the abdominal integument is typically black, but there

are species in several groups with largely pellucid-yellow abdomens (e.g. *canicularis, ochrogaster, pellucida*). There is a distinct median vitta in almost all species, which is typically strongly expanded at the posterior margin of each segment (i.e. triangulated), but in a few species is linear or evenly expanded at both margins. The pollinosity is typically fairly heavy and grey, but may vary from dark brown through grey to a distinct bluish-grey, or may be whitish and very weak. The pollinosity and median vitta provide important specific characters.

The female abdomen is usually distinctly less strongly pollinose than that of the male, with little or no trace of a median vitta. In many species, the abdomen is weakly pollinose, and the posterior segments are faintly or wholly glossy. The sixth to ninth segments form a largely membranous ovipositor which is normally telescoped within the fifth segment. Whereas the cerci and anal plates are fairly simple and not strikingly bristled, the shape and degree of sclerotization of the seventh and eighth segments provide important diagnostic characters, and the positions of the spiracles and the number and structural details of the spermathecae also assist in specific determinations. Although not always significant at the specific level, the ovipositor provides the best characters for specific recognition of many female *Fannia*.

Legs (Figs. 232-257).—The legs provide most of the specific and some of the group characters in the subfamily. The thickening of the apical half of the mid tibia and the presence of a mat of fine hairs on the ventral surface (Fig. 247) is diagnostic for the males of the subfamily, except for a few species of *Fannia* and the three genera where sexual dimorphism is weak. The females have few of the bristle characters of the males, but have instead a uniform reduction of bristling, except in a small number of species where there is a duplication of some bristles or the appearance of a few others.

Fore leg.—The fore coxa (C_1) shows almost no variation in bristling, except in some species of the *scalaris* group in which a ventral preapical thorn (actually a fusion of several bristles) is present.

The fore femur (F_1) shows little variation of taxonomic importance except in the posteroventral (pv.) row of bristles, where there is a reduction of the basal bristles in several species.

The fore tibia (T_1) is usually without distinct bristling except for a small anterodorsal (ad.) or posterior (p.) bristle. However, in *spathiophora* there is a full row of posteroventral hair-like bristles and in the *manicata* complex there is a cluster of thick bristles on the preapical posteroventral surface.

The fore tarsus is unmodified in the species of the Holarctic region, but in some tropical forms there is a distinct broadening of the apical tarsal segments.

Mid leg.—The mid coxa (C_2) is unmodified except in many species of the *scalaris* group where either one apical or two preapical bristles (Fig. 228) are strongly hooked and thickened.

The mid-femoral bristling is of considerable importance; the shape is occasionally modified, being preapically strongly constricted or somewhat arcuate. The bristling on the anteroventral (av.) surface particularly is important at the specific level. The primitive condition, a single row of setulose bristles, present in most females, is modified in many ways in the males. A preapical comb of short bristles is present in most species, whereas the medial bristles become stronger and heavier, reaching a striking state of development in the three thornlike bristles of the *sociella* subgroup. In other species there is a striking duplication of this bristle row, reaching a maximum in *scalaris* where there is a heavy cluster, made

up of about four rows, at about the apical fourth of the femur. The posteroventral surface is also slightly elaborated with usually longer, more slender and less differentiated bristling than on the anteroventral surface.

The mid tibia (T_2) (Figs. 234, 247) is simple in the females and enlarged to some extent on the apical half in the males. In the genera related to *Euryomma* the tibia of the male is fairly simple, whereas in *Coelomyia* and in several groups of the genus *Fannia* the tibia is distinctly swollen on the apical half and laterally compressed basally. In *manicata* the swelling is most striking, increasing rapidly on the apical half to twice its basal diameter. In *tuberculata, scalaris,* and *coracina* (Figs. 232-234) there are distinct glossy tubercles developed on the ventral surface. In the primitive forms the ventral mat of hairs is uniform throughout, but in the more advanced forms is only strong apically, the basal compressed area of the tibia with only a sparse row of short hairs. This basal area is usually ventrally glossy and may be developed posteroventrally into a distinct ridge. The anteroventral surface is bare except in females of four separate groups where one or two strong bristles are often present. The anterodorsals and posterodorsals are usually restricted to one bristle on each surface, but in two groups these bristles are increased to three or four. In the females of a few species there is a single posteroventral or ventral bristle.

The tarsus is usually modified, but most species of the *postica* and *hirticeps* groups have a ventral crest or thorn of fused bristles (Fig. 235) at the base of the metatarsus (mt_2), which is a valid specific character in most cases. However, a few species exhibit some intraspecific variation (see discussion of variation in *aethiops*). In the *lugubrina* group all species but one have a complete ridge of fused hairs on the ventral surface of the metatarsus (Fig. 234) which is most fully developed in *falcata.*

Hind leg.—The hind coxa (C_3) in the more primitive groups bears one to several bristles or hairs on the posterodorsal surface. In the other groups this surface is bare. This character is apparently fairly constant within any one group or subgroup (only a few abnormal specimens are known) and is not affected by sex.

The hind femur (F_3) is typically simple in shape, but in species of several groups is arcuate or preapically swollen. The bristling of the femur is quite important taxonomically. The anteroventral bristles in the male vary from a basally setulose row with three or four stronger preapicals (the female condition) to a full row of strong bristles (as in *lasiops* and *atra*), a fully setulose row (as in *aerea*), or a single strong preapical bristle as in the *spathiophora* subgroup.

The posteroventral bristles are even more variable. The row may be discontinued on the apical fourth or third with, in some cases, an increase in length of the bristles to this point. In other groups there is a preapical cluster of bristles, centered at a spot on the apical half of the femur, and often on a distinct elevation. This cluster may or may not be connected by a row of setulae to the basal area. The posteroventral row is often inclined basally or preapically onto the posterior surface.

The ventral surface in some groups, and especially in the *canicularis* group, is covered with hairlike setulae in two or three irregular rows.

The hind tibia (T_3) is simple in shape in most species but may be slightly arcuate in those with arcuate femora. The bristling is highly variable. In the primitive species there are full rows of short anteroventral, anterodorsal, and posteroventral bristles. In some species of the *scalaris* group the bristles are long

and slender, but in most of the groups the bristle rows are reduced, as in the females, to a single median bristle in a row of setulae or, in a few species, to setulae alone. The posteroventral surface is bare in most species.

Two dorsal bristles, a median and a preapical one, are present except in the aberrant species *columbiana* where there are five dorsal bristles, in *sociella* which possesses only the median dorsal bristle, and in *robusta* which possesses only the preapical dorsal bristle.

The ventral surface is bare except in those species where both anteroventral and posteroventral rows are well developed. In those cases there may be two or three rows of short erect setulae.

The hind tarsus is unmodified in all species.

Male genitalia.—The male genitalia (Fig. E), which for the purposes of this discussion will include the composite pregenital segment and the fifth sternum, as well as the structures of the ninth segment or hypopygium proper, are quite distinct in form from the comparable structures in other members of the family Muscidae. The most diagnostic element is the variously modified process arising from the base of cercal plate. It is most commonly a corkscrew shaped process with two turns, but this spiralling effect may be scarcely visible, as in several species of the *spathiophora* subgroup, or completely absent and replaced by a straight or curved form as in the *mutica*, *birticeps*, and *lugubrina* groups. There is moreover, in these groups, a tendency toward bifurcation, best developed in the *mutica* group. Finally, in the *canicularis* group, and in the genera *Euryomma*, *Platycoenosia*, and *Piezura*, such a process has apparently never been present, and

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Figs. A-F. *Fannia scalaris*

Fig. A. Head ♂, lateral view

Fig. B. Thorax ♂, lateral view

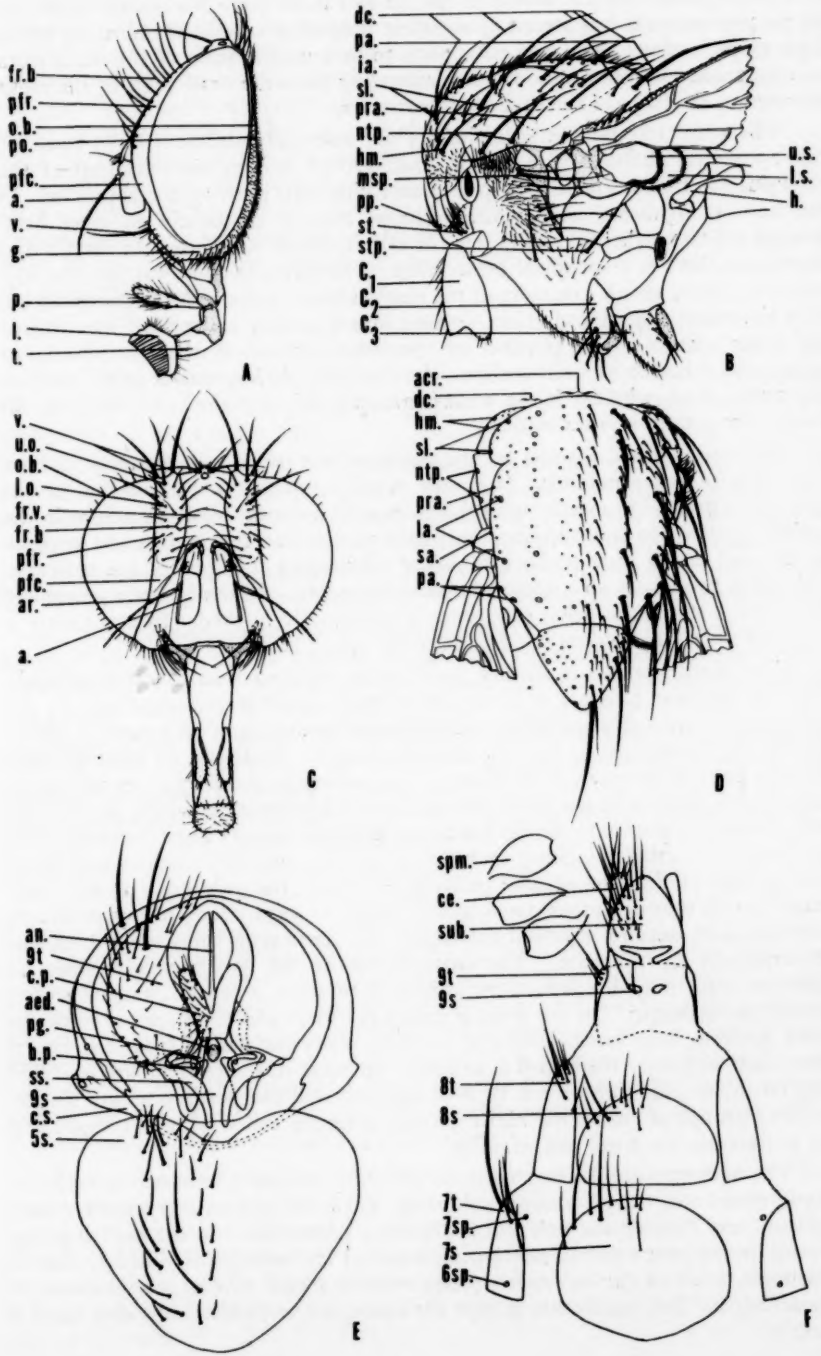
Fig. C. Head ♂, anterior view

Fig. D. Thorax ♂, dorsal view

Fig. E. Hypopygium and adjacent sclerites, posteroventral view

Fig. F. Ovipositor and spermathecae, ventral view

a.—antenna
acr.—acrostical bristles
aed.—aedeagus
an.—anus
ar.—arista
b.p.—bacilliform process
C_1—fore coxa
C_2—mid coxa
C_3—hind coxa
ce.—cercus
c.p.—cercal plate
c.s.—composite segment
dc.—dorsocentral bristles
e.—eye
fr.b.—frontal bristles
fr.v.—frontal vitta
g.—gena
hm.—humeral bristles
ia.—intraalar bristles
l.—labellum
l.o.—lower orbital bristle
msp.—mesopleural bristles
ntp.—notopleural bristles
o.b.—occipital bristles
p.—palpus
pst—postalar bristles
pfc.—parafacial
pfr.—parafrontal bristles
pg.—postgonite
po.—postoccipital bristles
pp.—propleural bristles
pr.—presutural bristles
pra.—prealar bristles
S.—sternum
sl.—sublateral bristle
sp.—spiracle
spm.—spermatheca
ss.—surstylus
st.—stigmatal bristles
stp.—sternopleural bristles
sub.—subanal plate
T.—tergum
t.—theca
u.o.—upper orbital bristle
v.—oral vibrissa
v.b.—vertical bristles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F

in *Coelomyia* and several unrelated species of *Fannia* there has been a reduction of the process until it is absent or apparent only after careful examination under high magnification. The process appears to be a modification of the bacilliform sclerite present in many muscoids and extending from the basal angle of the ninth sternum to the bases of the cercus and surstylus.

The ninth tergum and surstylus are not essentially different from those of other muscids, although there are in some groups striking modifications of the surstylus. In the *sociella* subgroup each surstylus bears a strong dorsal process. In the *mutica*, *lugubrina*, and *hirticeps* groups there is frequently an inner basal process which reaches a striking state of elaboration in *ungulata*. In *fuscula* and *americana* there is a subapical bifurcation. However, in most species, the surstylus is a fairly simple extension of the ninth tergum, more or less separated from it at the outer edge, the division grading into a weakly sclerotized line toward the inner margin. The position of the main process of the surstylus is an important indicator of relationships. In the *canicularis* group it arises next to the cercal plate, whereas in the *scalaris* group it arises at the outer margin. In most other groups it arises medially.

The cercal plate, formed by the fusion of the cerci, is moderately distinct from that of other muscids. It is only weakly formed in most species of the *canicularis* group but usually is a solid plate with a faintly bilobed apex, as in the *scalaris* group. In most species, particularly those of the *mutica* and *pretiosa* groups, the cercal plate is elongate, often reaching to the apex of the surstylus, and in the *postica* group is often preapically concave. In the *kowarzi* group and in the *aerea* and *minutipalpis* subgroups it is distinctly bilobed. In *aerea* there is a pair of prebasal processes in addition to the apical lobes.

The ninth sternum is usually much more reduced than in other muscids. Whereas in most muscids it is usually a broad shield-shaped structure, in the Fanniinae it commonly occurs as a strap-shaped semicircle, with a median sclerotized bridge extending to the base of the aedeagus. In almost all muscids there are two pairs of processes at the base of the aedeagus, the pregonites which are more or less fused with the ninth sternum, and the postgonites which are separate and posterior in position. In the Fanniinae, these are usually much reduced, with the pregonites entirely lacking, and the postgonites typically distinct and straplike, situated at the sides of, and partially enclosing, the aedeagus. In the *canicularis* group they are often strongly sclerotized to form strong horny processes, with the ninth sternum also well developed, the lateral arms being much broadened, especially at the base. The enlargement of the postgonites reaches an elaborate state only in *glaucescens*, where they form a heavy elongate sheath around the aedeagus. In the *postica* group the more elaborate species have the ninth sternum broadened, with one or more processes arising from the lateral arms, most strikingly developed in *aethiops;* the bases of the sternum are modified to a bifurcate condition of one type or another; and the postgonites are simple. In other groups of *Fannia* the ninth sternum is simple and weakly developed and the postgonites are weak and straplike.

The aedeagus, unlike that of other muscids, is most commonly completely membranous. In the *glaucescens* subgroup, and in the genera *Euryomma*, *Platycoenosia*, and *Piezura*, the aedeagus is distinctly sclerotized. In the *mutica* group several species have a partial sclerotization so that the aedeagus is visible in cleared specimens, while in the *carbonaria* group there is a basal ventral sclerotization of the aedeagus. But in all other groups the aedeagus can be seen only after careful scrutiny.

The fifth sternum is quite variable. In the *canicularis* and *scalaris* groups it is usually little modified in shape and bristling from that of other abdominal sterna. There is, however, a distinct trend toward a short, almost strap-like sternum with all the bristles short, strong, and concentrated along the posterior margin. Such an extreme condition is visible in many of the *postica* group, and in the *aerea* subgroup. The posterior shift of the bristles is often more distinct than the reduction of the sternum itself. In the *setifer* subgroup, the bristles have shifted to near the margin, and there is a distinct, weakened line just basad of them. In *glaucescens*, as an unusual modification not even indicated in other species, the sternum is produced medially to form a strongly sclerotized triangular plate, completely without bristles, and fused solidly with the ventral margin of the pregenital segment.

Female Ovipositor.—The ovipositor (Fig. F) in most muscids is rather simple, and shows no striking changes in proportions. In the Scopeumatinae there are rather striking differences in proportions and extent of sclerotization, valuable at the group level. In the Anthomyiinae there are slighter differences, but they are generically of some importance.

In the Fanniinae there is moderate variation in the sclerotization of terga and sterna, which is of limited group value, but frequently of specific value. The spermathecae are also of value. They number two or three, and there is considerable variation in shape, in surface corrugation, and in the extent of sclerotization of the ducts. The combination of sclerite modification and spermathecal structure permits the identification of species groups and certain aberrant species.

In the *canicularis* group the spermathecae are two in number and smooth and spherical in shape. In the *scalaris* group there are three spermathecae; in the *scalaris* subgroup they are pear-shaped and smooth or slightly corrugated, and in the *fuscula* subgroup they are more elongate and strongly corrugated. The *serena* group has two spermathecae which are usually elongate and corrugated, with the duct sclerotization fairly extensive and the base strongly curved and somewhat swollen. In the *mutica* group there are two smooth spherical spermathecae, each with a distinct, curled duct base. In the *postica* group they are more elongate, weakly corrugated, and indented at the apices.

Eggs

Figs. 271, 272

The eggs of all the *Fannia* species I have been able to examine are characterized by having a pair of laterodorsal flanges or wings of chorion which extend the entire length of the egg. The eggs are elongate-oval, and the main surface is smooth and broadly ribbed longitudinally, while the dorsal surface (between the flanges) has a raised hexagonal pattern resembling a honeycomb. When the egg is protruding from the ovipositor, the flanges are folded over the dorsal surface and often cover all but a small triangular area at each end, but after oviposition they probably spread out to serve as a flotation mechanism.

The variation within the subfamily is rather slight. In the *scalaris* and *canicularis* groups there seems to be little variation from the above description. The lateral wings are thin and membranous, the main surface is only faintly ribbed, and the honeycombing is distinct. In *corvina*, however, the wings are strong and thick, and the dorsal pattern is faint. The ribbing, on the other hand, is fairly strong. In *depressa* the wings are very thin and narrow, and the dorsal pattern is distinct.

In some other species the dorsal pattern is broken by a smooth longitudinal ridge on the median line.

Since only about one per cent of the females have an egg extended from the ovipositor, and the examination of eggs still in the female abdomen is quite difficult, a comprehensive study has not yet been possible.

Larvae

Figs. 273-284

The larvae of the Fanniinae are very distinctive, sufficiently so that the early workers on the group used their shape as a primary character for *Fannia* and the Fanniinae. More recently, Roback (1954) used larval characters almost exclusively in raising the group to family rank.

Although a similar external form is not found in any of the other muscoid groups, there are similar forms in the Platypezidae and Phoridae, which are known to live in fungi, the most common known habitat of fanniine larvae, suggesting that the lateral processes so characteristic of these forms are a special adaptation to this mode of life.

The larvae of Fanniinae are somewhat dorsoventrally flattened, usually with a well-developed pair of plumose, laterodorsal processes on each segment from the third to tenth, and a less well-developed pair (sometimes absent) on the lateroventral surfaces. The eleventh (terminal) segment bears three pairs of marginal processes. Dorsally there is a pair of median processes, often only weakly developed or absent, extending from the second to tenth segments. Dorsally, next to the laterodorsal processes, there is sometimes another pair of weakly developed processes, the dorsolaterals. On the first two (thoracic) segments there is only a single pair of marginal processes.

Ventrally there are two pairs of more or less weakly developed processes, a medial pair and a widely separated ventrolateral pair, which usually appear only as faint button-like prominences.

All the processes, where developed, are hollow and feather-like in construction, the laterodorsals and lateroventrals bearing up to a dozen pairs of strong lateral projections or branches on their main axes. In some of the groups, the projections are not distinctly lateral but arise from all surfaces of the main shaft; this probably indicates the primitive condition. The projections are frequently bifurcate or trifurcate toward their apices. Toward the apices of the processes the projections are weakly developed, and appear as only faint tubercles, giving the process a rat-tail or scaly appearance.

The integumental patterns of the puparia are much more distinct than those of the larvae and show considerable variation from group to group. In the *canicularis* and *scalaris* groups there is a fairly even network of lines, with the interspaces faintly raised. In *Platycoenosia* the interspaces bear from one to three short spinules, but normally there are no spinules present anywhere on the surface. In all other known species there is a pattern of tiny, blunt-tipped processes, either irregular or arranged in rows, that often outline polygonal areas. It is expected that when more material is available the integumental patterns may be valuable in determining species relationships.

The prothoracic spiracle bears from three to a dozen short processes arranged in a radial fashion around the base. The number of spiracular processes is probably a valuable group character, with the length and arrangement of the processes also important.

The posterior spiracles are typically raised on short but distinct stalks, with the spiracular slits appearing as small circular cavities at the tips of short finger-like processes at the apex of each spiracular stalk. These processes are more or less radially arranged in most species, distinctly set at right angles to each other in the *canicularis* group, *Platycoenosia*, and *Euryomma*.

The position of the spiracular stalks on the terminal segment varies significantly. The description of *hamata* (Séguy, 1945) indicates that they are set very close together; whereas they are set well apart (about halfway between the median line and the margin) in most species of the *scalaris*, *pretiosa*, and *canicularis* groups of *Fannia*, and in *Platycoenosia* and *Euryomma*. In other groups in which larvae are known they are set very far apart, near or on the lateral margins of the segment. The length of the stalk varies from scarcely evident (*manicata*) to as much as one and a half times as long as the medial diameter (some of the *canicularis* group).

The anal slit and the ridges on the ventral surface of the terminal abdominal segment vary in shape from group to group, and more material may prove that they are of some taxonomic value. However, it is anticipated that there is considerable individual variation.

The mouth parts of the larvae are fairly characteristic of the subfamily but are apparently only slightly variable within the group. They lack parastomal bars, the pharyngeal sclerites are weakly sclerotized, lack windows and are not flaring, the mouth hooks are usually strong and well separated, and accessory sclerites are lacking. Several of the known larvae which live in leaf litter are characterized by reduced and atrophied mouth hooks, as in *macalpinei* (Fig. 279) and *falcata* (?) (Fig. 286).

The above details are based on the examination of the larvae or puparia of sixteen species of *Fannia*, one species of *Platycoenosia*, and (Chillcott, 1958b) two species of *Euryomma*, and on literature references to six other species of *Fannia*.

EVOLUTIONARY TRENDS

Prerequisite to a discourse on evolutionary trends is the determination of the basic characters and the trends of change in these characters. From this study is developed the picture of a hypothetical primitive (ancestral) form which possesses in combination the primitive states of these characters.

Sexual dimorphism is well developed in most of the species, but its development is evident within the group, indicating that the primitive condition is a lack of striking sexual dimorphism. This dimorphism affects a great many characters in the male, while there is little change in the female; the male characters are different in different groups. Hence, the females most clearly indicate the primitive condition, and the trends in the many secondary sexual characters of the male become clear.

The other main trend that is apparent is the change from an evenly haired or setulose condition to a condition of differentiated or reduced bristling or both. Except for the few sclerites that evidently become secondarily haired–the propleural and hypopleural sclerites–this trend is widespread throughout the calyptrate Diptera, and there are, to the author's knowledge, no cases of reversal in this trend.

On the basis of these two trends, the organization of a double list of primitive and specialized conditions of the many characters is possible for all but the genitalia, the squamae, the integument, and certain head structures, for which the

trends can be worked out only by more intensive study of the structural modifications.

The integument throughout the genus is generally black, and moderately pollinose. Yellow abdominal integument occurs in 10 species of three groups, and yellow antennae, palpi, or legs occur in several other species. Most of these species are rather specialized, and there seems little doubt that black integument is the primitive condition, especially since this is the most common condition in muscoids generally. Similarly, generally glossy or subglossy integument is found in the *carbonaria* subgroup and in *glaucescens*, while a glossy theca is found in the *lugubrina* group and, to a lesser extent, in the females of the *carbonaria*, *serena*, and *postica* groups. General pollinosity is the rule among other muscoids and is undoubtedly a primitive character.

The parafrontals of the female are usually convex and one-third as broad as long, as in *Euryomma* and *Platycoenosia*, in which there is no head dimorphism. Broader or narrower parafrontals occur mainly in the *fuscula*, *carbonaria*, and *aerea* subgroups which are more specialized than their close relatives. The fact that convex and moderately broad parafrontals are intermediate, are present in the majority of species and in all the less specialized species, and are present in species with little or no head dimorphism indicates strongly that this is the primitive condition; even though the common condition in muscoids is a very narrow parafrontal.

The pubescence of the arista is typically very short, is never absent, and only in *F. difficilis*, *Platycoenosia*, *Piezura*, and *Euryomma* does it tend to become long or plumose. Once again the choice is the intermediate, more widespread condition as the primitive one. In this case, the conclusion for the subfamily is backed up by evidence from the Muscidae generally, where a short-pubescent arista is the most common condition.

Similarly the theca is commonly a moderately pollinose, weakly sclerotized structure. A slender, tubular, well-sclerotized theca is characteristic of the *lugubrina* group, and a short, swollen, and well-sclerotized theca is characteristic of females of the *postica*, *serena*, and *carbonaria* groups. The intermediate and most common condition is considered primitive, especially since the others are associated with a lack of pollinosity, obviously a specialized character.

The primitive structure of the squama is open to considerable doubt. Subequal size is the common and also the intermediate condition. There is no trend evident in any group although there is considerable variation in the *carbonaria* and *postica* groups. In addition, it is accepted that primitively squamae were not or little developed, and a linear lower squama is characteristic of most Scatomyzinae and Anthomyiinae. Nevertheless, in the Fanniinae a linear lower squama is present only in the *F. serena* group and the related genus *Coelomyia*, whereas in the other, more primitive groups of *Fannia*, the lower squama is well developed. The linear lower squama is probably primitive, although on the basis of the subfamily itself a moderately developed lower squama seems to be more likely.

The deduction of primitive and specialized characters of the genitalia is based on a single hypothesis, that the simpler structure is more primitive. This assumption is supported by the fact that most other muscids have a simple genitalic structure. The only serious deviation from the usual list of primitive muscoid characters concerns the aedeagus, which, unlike that of other muscoid groups, is rarely sclerotized. Any sclerotization is usually weak, and the aedeagus has a definite shape only in *laevis*, *latifrons*, and the small genera related to the *canicularis* group, and there is no close resemblance to the shape of other muscoid

aedeagi. Since the latter fact suggests separate evolution rather than relationship, the conclusion that an unsclerotized aedeagus is primitive seems correct.

The female ovipositor is a modification of the sixth to ninth abdominal segments of the female, and hence the primitive condition is that of a primitive abdomen. The conclusions about primitive spermathecal structure are based on the hypothesis of simplicity mentioned above.

Table I is a detailed summary of the results of this study.

The preceding tabulation suggests the evolution of many structural characters in the subfamily as a unit. However, I believe that the trends in certain groups deserve further study that will clarify the reasoning behind the summary, and show the step by step modification of certain structural characters.

In the *scalaris* group, the modification of the legs and the development of special fused bristles in the male make the tracing of the evolutionary trends much easier than in most other groups.

In *scalaris*, an unusually modified species, there is a striking glossy tubercle on the mid tibia, and two hooked bristles preapically on the mid coxa, with the apical bristle unmodified. A less striking tibial tubercle is present in *coracina*, which lacks mid-coxal bristles. Species with similar coloration and appearance are *incisurata*, *annosa*, and *trianguligera*, which have neither modified bristles nor tuberculate mid tibiae. *F. incisurata*, primitive in structure, is extremely setulose, with even the scutellum completely covered with setulae, whereas *scalaris* shows the more reduced condition with thoracic setulae sparse and the scutellum bare basally. The modification of mid-femoral bristling is also striking. *F. incisurata* has simple setulose rows of anteroventral and posteroventral bristles, whereas *scalaris* has a distinct ventral doubling of strong medial bristles. *F. coracina*, *annosa*, and *trianguligera* are intermediate for both characters. This complex shows the change from simple femoral bristles and numerous thoracic setulae to differentiated and duplicated femoral bristles and reduced thoracic bristles.

F. manicata is the end of a second line of modifications. The fore coxa has a preapical ventral thorn, the mid coxa has a broad hooked apical thorn, and the mid tibia is strongly enlarged on the apical half. Tracing back the trend, *monilis* shows a weaker coxal thorn and a less modified mid tibia; and *enotahensis* has an even less distinct coxal thorn. All three have a strongly developed clump of broad preapical setulae on the fore tibia. *F. columbiana* and *ciliatissima* have moderately developed coxal thorns but lack the modification of the fore tibia. *F. atripes* has only a weak and faintly hooked mid-coxal thorn.

Having established the sequence *atripes–ciliatissima–enotahensis–monilis–manicata* by the study of these special structures, let us start with *atripes*, and study other less striking characters. *F. atripes* has three to five T_3 avs. and five ads., all short. *F. ciliatissima* and *columbiana* have full rows of long avs. and ads. *F. enotahensis* and *monilis* have full rows of stouter av. and ad. bristles and possess as well a few differentiated and erect pv. setulae. *F. manicata* has much the same bristling, except for a full row of pv. setulae equal in length to the tibial width.

A third sequence is visible in the *fuscula* subgroup which is generally more advanced than the *manicata* complex. The strong mid-coxal thorn is present and strong, and, instead of the fore-coxal thorn, there is a strong sternopleural thorn. *F. americana* is the most modified species, in which the reduction of the thoracic setulae, referred to in the study of the *scalaris* complex, has proceeded until the intraalar setulae have been reduced to a single row, and

TABLE I

Primitive vs. Specialized Alternatives of Certain Characters

	Primitive	Advanced
HEAD		
Postocciput	Evenly bristled	Completely bare
Occipital bristles	Long, slender, uneven	Short, even
2nd antennal segment	One weak bristle	2-3 strong bristles
3rd antennal segment	Twice as long as broad	Short, stubby
		Distinctly elongate
Arista	Weakly pubescent	Bare or plumose
*Theca — Pollinosity	Weakly pollinose	Glossy
* — Shape	Twice as long as broad	More elongate
		Short and swollen
Labium	about 15 pseudotracheae	about 8 pseudotracheae
Palpus	Linear	Spatulate
Parafrons ♂ ♂	Broad	Narrow
* ♀ ♀ Shape	One-third as broad as long	Two-thirds as broad as long
		Narrow (one-fifth as broad as long)
* Pollinosity	Pollinose	Glossy
	One row of setulae	Many setulae
Frontal bristles ♂ ♂	12-15; slender	Few, short strong
*Upper orbital	Present in both sexes	Present only in ♀ ♀
THORAX		
Propleuron	Haired	Bare
Mesonotum	Pollinose	Glossy
*Intraalar setulae	Many	One row
*Prealar bristles	Setulose	Distinct or absent
Acrostichal bristles	Quadriserial	Biserial
Dorsal row of mesopleural bristles	Undifferentiated	Differentiated, strong
*Ventral sternopleural bristle	Weak	Strong, thornlike
Sternopleurals	2 strong	3rd developed
Scutellum	Fully setulose	Disc bare
	Unicolorous	Spotted or banded
*Lower squama	Linear	Large and produced
	White to yellow	Brown
Haltere	White to yellow	Brownish-black
Wing	Clear	Yellow, brown or pictured
LEGS		
Color	Black	Red to yellow
Fore coxa	Ventrally setulose	With strong preapical ventral bristles or thorn
Fore-femoral posteroventrals	Full row, strong	Basally reduced
*Fore tibia	Bare medially	With bristles on anterodorsal and posterior surfaces medially
		With preapical bristle clump
		With row of posteroventral hairs
*Mid-coxal bristles	Slender, normal	Flattened, thornlike, apically hooked
*Mid-femoral anteroventrals	Short, even setulose	Strongly differentiated
posteroventrals	Short, even, setulose	Strongly differentiated
ventrals	One row, setulose, on median third	Two or more rows, strong, extending from base to apex
*Mid tibia — shape	Evenly and weakly expanded to apex	Strongly swollen, or tuberculate on apical half
		With a basal posteroventral ridge or tubercle
* — ventral mat	Weak uniserial row	Dense multiserial mat
*Mid metatarsus	Ventrally setulose	Fused ventral ridge
		Basal crest

*Characters used in estimating group relationships.

TABLE I—*Continued*

	Primitive	Advanced
*Hind coxa	Posterior margin haired	Posterior margin bare
*Hind femur	Straight, simple	Arcuate or clavate
*Hind-femoral anteroventrals	3-5 preapicals strong	Full row of strong bristles
		Completely setulose
* — posteroventrals	Even row of setulae	Full row of long bristles
		Apical half bare
		Bristle cluster on apical half
Hind tibia	Straight	Arcuate
*Median bristles	1 each on anteroventral, anterodorsal and dorsal surfaces	Full rows on these surfaces
		Posteroventrals developed
		Absence of some bristles
Hind tarsus	Normal	Apical segments swollen or flattened
Apical bristles	Short, straight	Long or curled
ABDOMEN		
Integumental color	Unicolorous black	Yellow or bicolored
Pollen	Moderate	Glossy or heavily pollinose
	Brownish-grey	Dark brown, bluish or whitish
Median vitta	Triangulated	Parallel-sided
	Without lateral spots	With lateral spots
Proportions	3 : 5	2 : 5
		1 : 1
MALE GENITALIA		
Hypopygium	Inconspicuous	Swollen
	Evenly setulose with one strong dorsal	Bristles only dorsally
*Cercal plate	Simple	Elongate with various processes
*Surstylus	Simple	Complex, bearing processes, apical hooks
*	Medially placed	Offset
*Bacilliform process	Straight or curved	Spiralled
	Simple	Doubled or furcate
*Ninth sternum	Slender band	Broadened with processes
*Postgonite	Simple, flap-like	Heavily sclerotized or reduced to stubs
*Aedeagus	Membranous	Sclerotized
Fifth sternum—shape	Simple, longer than broad	Broader than long or divided
* —bristles	Evenly distributed	Concentrated at posterior edge
	Weak	Strong, short
Composite segment	Dorsally broad	Dorsally reduced
FEMALE GENITALIA		
Terga	Even	Dorsally reduced
*Spiracle 6	In 6th tergum	In membrane next 5th
7	In membrane next anterior margin of 6 T.	In 6 T.
*Sternum 8	Plate-like	Absent
		Two small plates with bristles
	Without apodemes	With an anterior ventral apodeme
Sterna 6 and 7	Elongate	Transverse
Subanal plate	Broad	Elongate
Cercal bristles	Short	Long, hair-like
*Spermatheca — number	Three	Two
* — shape	Globose	Pear-shaped to elongate
	Apex smooth	Apex indented
* — surface	Smooth	Corrugate
* — duct stem	Unsclerotized and straight	Sclerotized and basally curved

*Characters used in estimating group relationships.

the prealar bristle is distinct. Intermediate (less reduced and differentiated) bristling is visible in *vesparia* and *pellucida*. This subgroup also has the postoccipital bristling more reduced than in the previous two complexes, so that there are no postoccipital bristles on the dorsal half of the head. However, the shape of the parafrontals most clearly establishes the sequence *vesparia–pellucida–fuscula–americana*. In *vesparia* the parafrontals are contiguous in the male, and broadly separated but parallel-sided in the female. In *pellucida* the parafrontals of the male are similar, but in the female they are narrower and closer together. In *fuscula* and *americana* the male parafrontals are distinctly separated and the female parafrontals are very slender and almost as close together as in the male. The change from few to many hind-tibial bristles, traced out in the *manicata* complex, can also be seen in this sequence.

The above discussions exemplify many of the trends visible within species groups of the genus, and the manner in which the summary of primitive and specialized characters has been worked out. It is impractical and unnecessary to work through all the species groups, since the trends discussed above develop in parallel fashion in several other groups, and trends in other characters will be briefly pointed out in the taxonomic section and can often be followed by reference to the illustrations.

It is a not infrequent fallacy that there is necessary correlation between specialization in one structure and specialization in another. Unless the structures are integrated into a functional association, there is usually no such correlation, and it is erroneous to refer to one species as more or less specialized than another. However, in *Fannia*, as examples above show, the trends in sexual dimorphism and bristle differentiation are often correlated with each other and with increase in structural complexity, so that one species will have several primitive characters and another will have several specialized characters, with other species occupying intermediate positions with regard to most of those characters. The example given above, however, is unusually complete, and such perfect linear series are an exception. Most species groups show a greater diversity of modifications, so that there are "aberrant" species with combinations of very primitive and highly specialized characters.

SPECIES GROUPS IN *FANNIA*

Group Characters

As in other muscoid groups, supraspecific categories in the Fanniinae tend to lack sharp definition because of the survival of relatively unmodified species intermediate between the more compact species clusters. The chaetotaxy is modified along parallel lines in various groups to the extent that it cannot be used as a group character except where striking deviations from the normal trends are involved. The structural variations visible externally are few in number. The structures of the proboscis and squamae furnish stable group characters, but abdominal and leg modifications are usually of minor significance at the supraspecific level, although striking modifications do occur in certain restricted species clusters. The normally concealed structures of the male genitalia, on the other hand, show striking differences from group to group and yet are relatively stable within the species groups. Hennig (1955) recognized this fact and published figures of the male genitalia of all species available to him. In addition, he defined the *canicularis* and *scalaris* groups almost entirely on the basis of genitalic structure. He also noted several other species clusters of limited size and commented on the resemblance of *Coelomyia* to *F. serena*.

The groupings given herein are based largely on male genitalic structure: not only the surstylus and the bacilliform process, but also the ninth sternum, the aedeagus, and the fifth sternum. Additional characters are drawn from the structure of the ovipositor and spermathecae, and, to a limited extent, from larval structure.

Male Genitalia (Figs. E, 1-154)

The shape of the cercal plate particularly is important. In the *canicularis* and *scalaris* groups it is weakly fused on the median line and fairly simple. In most of the other groups, fusion is practically complete, and the cercal plate is typically elongate and often bears apical or preapical processes. The *lugubrina* group is easily recognized by the presence of a pair of curved spines on the preapical ventral surface of the elongate, flattened cercal plate (Fig. 25). In the *postica* group, the cercal plate is elongate and typically concave medially (Figs. 54, 60). In the *carbonaria* group there are two apical processes directed ventrally and frequently a median one directed dorsally (Fig. 64). In most of the other groups the cercal plate is somewhat elongate but not strikingly modified.

The surstylus (Fig. E, ss.) is also significant, especially the position of the main process. In the *canicularis* group this process is next to the cercal plate and parallel-sided (Fig. 129); in the *scalaris* group it is distinctly marginal and weakly tapered (Fig. 4); whereas in most of the other groups it arises medially and tapers evenly to apex. In the *mutica* and *hirticeps* groups an inner basal process of each surstylus has developed (Fig. 30), and in the *carbonaria* group there is a median dorsal expansion that occasionally develops into a distinct process.

The bacilliform process (Fig. E, b.p.) takes a variety of shapes that are fairly constant within groups. In the *scalaris* group it forms a strong corkscrew-like spiral (Fig. 4). In species of several other groups – *serena, pretiosa, benjamini, postica,* and *carbonaria*– it has a barely perceptible twist. In the *hirticeps, lugubrina,* and *mutica* groups it is straight and often partially or completely bifurcate (Figs. 14, 20). In the *canicularis* group and the small genera the process is absent.

The ninth sternum (Fig. E, 9s) is simple except in the *canicularis* group where the entire structure is broad, the postgonites are heavily sclerotized or reduced to tiny palp-like structures, and the aedeagus is frequently strongly sclerotized (Figs. 129C, 142A). The *postica* group, however, frequently has the lateral areas broadened with submedian processes, but the sternum is membranous except in *aethiops,* in which the entire structure is sclerotized and bears spine-like processes (Fig. 54A). The aedeagus is membranous in all groups except the *canicularis* group, mentioned above, and the *mutica, lugubrina,* and *carbonaria* groups, in which it is partially sclerotized.

The fifth sternum (Fig. E, 5s) is of limited use in distinguishing species groups. The *scalaris, canicularis,* and *serena* groups have the sternum primitively elongate with evenly distributed bristles, whereas in most other groups it is shortened with the bristles crowded toward the posterior margin. The *benjamini* subgroup is strikingly characterized by a semicircular band of membrane separating anterior and posterior portions of the sternum and bearing an irregular row of bristles (Fig. 97). Most other variations occur in only a few species and do not contribute to separation of groups.

Female Genitalia (Figs. F, 155-221)

The group characters of the spermathecae and ovipositor are much less numerous and striking than those of the hypopygium, with some parallel developments in spermathecal complexity, but they are adequate to set off certain groups.

The *canicularis* group is unique in having the spermathecae spherical or slightly barrel-shaped, the duct base being weakly sclerotized and straight (Fig. 208). In all other groups, the spermathecae are spherical to pear-shaped or elongate-tapering, and as the increase in length occurs, the surface changes from smooth to corrugated, and an apical dimple develops. In all of these groups, the duct base is curved and swollen. There are three spermathecae in the *scalaris*, *pretiosa*, and *mutica* groups, and two in all others.

The position of the last two spiracles and the shapes of the sclerites are of limited value as group characters, due to the considerable interspecific variation.

Chaetotaxy

On the basis of groupings revealed by the genitalic structures, the more stable characters of the chaetotaxy were selected so that the groups might be recognized without dissection.

Bristles are present on the posterior margin of the hind coxae in six different groups or subgroups scattered throughout the genus. This is evidently a primitive character, yet, unlike other such characters, it is remarkably constant within groups.

Numerous bristles occur also on the hind tibia in several distinct groups, but their occurrence is sometimes inconstant, and they must be used with care in defining groups; they occur uniformly in the *scalaris* and *mutica* groups and in certain aberrant species of distinctly unrelated groups.

The number of rows of acrostical bristles also suggests parallel evolution, and must be used with caution. The number and strength of the prealar bristles are characters associated (highly correlated) with it.

In the proper framework, they are both very useful, but cannot be satisfactorily used as primary characters.

Additional characters that are reasonably effective in defining several groups are the presence of two or more median bristles on the anterior and posterior surfaces of the mid tibia, the setulose parafacials, and the female parafrontal bristling.

External Structure

The shape of the lower squama, a character largely ignored previously, is very useful in the definition of groups. In the *serena* group (and *Coelomyia*) the lower squama is completely linear, whereas in all other groups it has at least an inner lobation. In the *postica* group the lobe is small and rarely projecting beyond the upper. In most other groups the squamae are at least subequal, and normally the lower is strongly projecting. In the *setifer* subgroup the lower squama is elongate triangular in shape.

The proportions and pollinosity of the theca are usually clearly visible and of considerable value in separating some of the groups in the female. In the *lugubrina* group the theca is slender, elongate, and glossy in both sexes. In the majority of the other groups it is weakly sclerotized and pollinose, but the females of the *postica* and *serena* groups have a short, swollen, usually glossy theca, as is found in some males and most females of the *carbonaria* group.

The shape of the palpus is a third structural character which is occasionally useful at the group level. In the *minutipalpis* subgroup there is a distinctly reduced palpus in both sexes. In the *spathiophora* subgroup several species have a weakly to strongly spatulate palpus in the females, while in the *postica* subgroup it is always linear. Broadening of the palpus, however, occurs in several isolated species of other groups, and hence loses much of its value as a definitive character at the group level.

The shape of certain of the leg segments, particularly of the mid tibia, is a valuable group character if used with caution. The tendency in various groups is toward a strong enlargement of the apical half, the basal half being flattened and ventrally glossy. In the *canicularis*, *pretiosa*, *mutica*, and *benjamini* groups the mid tibia is not or scarcely modified, but in many members of the *scalaris*, *lugubrina*, and *postica* groups it is strongly modified. Most groups, however, are not uniform in tibial development, and the character must be used with qualification.

Immature Stages

Any group characters that may be present in egg morphology could not be recognized at this time due to lack of material. There are indications that the *canicularis* and *scalaris* groups have the primitive structure with well marked pattern on the dorsal surface and broad wings of chorion, whereas the other groups in general have less well marked dorsal pattern and narrow wings.

The characters of the larvae and puparia, however, appear to be of considerable value in defining groups. The information, however, is still scanty, for the 19 species of the subfamily known to me in the larval stage represent only nine of the 18 groups and subgroups of *Fannia*, and only two of the other four genera. Moreover, some of the representatives of species groups are aberrant and atypical in the adult, and so probably do not present the normal aspect of larvae of that group.

The *canicularis* and *scalaris* groups of *Fannia* have a smooth integument, with numerous depressed lines forming a hexagonal network on the surface. *Platycoenosia* has a very similar integument, but there are from one to three small spicules on each interspace of the network. *Euryomma* and the other groups of *Fannia* have a distinctly different type of integument, which is smooth with more or less numerous, rounded elevations or warts on the surface. These warts sometimes form distinct hexagonal patterns on the integument, or may be developed (e.g. *falcata*) into distinct spicules or processes in certain areas. Scattered among the warts in certain areas may be larger plates which possibly have a sensory function. As yet no definite group characters have been found in the types of warted integument, although it is probable that, with more material, these will be found.

The development of the lateral processes is a group character in only a limited way, since there is considerable variation within groups. The *lugubrina* and *postica* groups have the lateral processes scarcely developed even on the terminal segments, although they are moderately developed in the atypical *genualis*. They are strongly developed in the *scalaris* group and in ? *brevipalpis*, moderately developed in most others, but are almost without lateral projections in the *benjamini* group. The relative length of the processes may show distinct group characters when more material is available. Strong ventrolateral processes are present in the *scalaris* and *canicularis* groups of *Fannia* and in *Platycoenosia*

and *Euryomma*, but are absent or reduced, particularly on the terminal segment, in the other known groups of *Fannia*.

The posterior spiracles have valuable group characters. In the *scalaris*, *canicularis*, and *pretiosa* groups of *Fannia* and in *Platycoenosia* and *Euryomma* the spiracular stalks are set well in from the margin of the terminal segment; in the *benjamini* group they are close to the lateral margin, whereas in most other known groups they are adjacent to or on the lateral margin. In the *canicularis* group of *Fannia* and in *Platycoenosia* and *Euryomma* the spiracular processes are long and more or less at right angles to each other on long stalks; in the *scalaris* and *pretiosa* groups of *Fannia* they are radially arranged on short stalks, while in most other groups of *Fannia* they are asymmetrically arranged on usually short stalks.

The anterior spiracular processes are usually six to ten in number and moderately distinct, as in the *scalaris* and *canicularis* groups of *Fannia*. However in the *lugubrina*, *postica*, *serena*, and *carbonaria* groups they are small and inconspicuous; and in the *benjamini* group the number of processes is reduced to three.

The extent of reduction of mouth hooks does not appear to be constant within all groups, and while most groups have well-developed mouth hooks some reduction is apparent in members of the *lugubrina* and *serena* groups of *Fannia*. It is possible that with more material certain groups may show distinct differences in this respect.

Intergroup Relationships

The foregoing discussion of group characters has already indicated certain group clusters and other isolated groups. The purpose of this section is to evaluate these similarities and differences and outline a diagram of relationships based on these. The intragroup relationships will be discussed in the taxonomic treatment of each group.

The presence of many distinct species groups in the genus, and the wide divergence of certain characters and relatively parallel and even convergent trends of other characters made a direct comparison method of establishing relationships very difficult. An attempt was therefore made to set up a relatively objective method of study. Thirty-three characters were selected from the list of characters on pages 22-23, as having some value in group definition (as briefly discussed above). These characters were then compared between groups (as expressed in the group descriptions) and differences between groups totalled to give an "index of divergence". Since it has been fairly well established that chaetotactic characters in general follow parallel trends, these were given a maximum rating of 1.0, whereas structural characters were given a maximum rating of 1.5. Degrees of difference for each character were given in units of .5, since group values are already averages, and only broad distinctions are possible. The totalled values between groups were then set up in a matrix table as shown in Fig. G.

Considering the crudeness of the method the results are surprisingly interpretable. Values above 18 indicate strong divergence, e.g., between the *canicularis* and *scalaris* groups and between them and all other groups. Values between 10 and 15 indicate moderate relationship, as between the *lugubrina*, *hirticeps*, and *postica* groups (group composites are surrounded by wavy lines); and values below 10 (circled) indicate only subgroup differences. Values tend to be low when a group is relatively unspecialized with regard to several characters

Fig. G. Matrix table of indexes of divergence between genera, species groups, and species subgroups of Fanniinae.

(e.g., the *mutica* and *kowarzi* groups), and in a few cases convergent or parallel development of several characters gave unreal indexes (boxed by straight lines) (e.g., 11 between *serena* and *postica* groups).

The drafting of a diagram of relationships from these figures is possible only by departing from the relative objectivity of the indexes, since considerable distortion and rotation is necessary to reduce the multidimensional relationships to the two-dimensional diagram required for publication.

An attempt was first made to resolve the indexes of divergence into a three-dimensional figure by placing pins in a plasticine ball with the heads of the pins indicating species groups, and the distances between the heads proportional to the indexes. Reasonable success was achieved by considering values over 18 as indefinite (i.e. capable of being shown with values from 18 to 30). Heads extending only a short distance above the surface of the ball indicate primitive groups, and heads set well clear of the ball indicate strongly modified groups. The result is shown in Fig. H, with the *scalaris* and *serena* groups indicated as extending from the far surface of the ball.

Finally a two-dimensional diagram, less accurate but more easily understood, was constructed in a dendrogram form or phylogenetic tree (Fig. I). Indexes of divergence are shown along the left side, and lines of adaptation diverge in

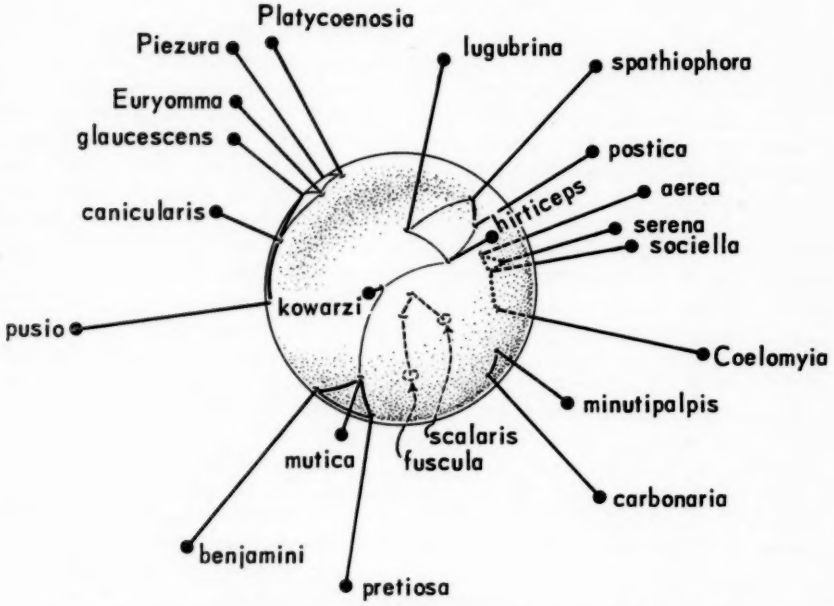


Fig. H. Three dimensional diagram of relationships within the Fanniinae. Heavy lines on the sphere connect subgroups, and light lines connect closely related groups; dotted lines indicate similar relationships on reverse surface of sphere.

accordance with the indexes, rather than a temporal scale, since no fossils are available to estimate actual times. Thus the points of divergence have no necessary correlation with an evolutionary time-scale, especially since the rate of evolution in the various species groups were probably not identical.

The last diagram can be correlated with a sequential discussion of evolution within the subfamily.

The most divergent and hence probably the earliest separate group is the *canicularis* line (1), which includes not only the *canicularis* group, but also the small genera *Euryomma*, *Platycoenosia*, and *Piezura*. In this line the bacilliform process was lost, the aedeagus or the postgonites became sclerotized, and dimorphism tended to be absent.

The *pusio* subgroup diverged from the main line most strongly, by developing strong dimorphism, a trimaculate male abdominal pattern, elongate sclerotized postgonites, a slender ninth sternum, and a bilobed surstylus. In the opposite evolutionary direction, the small genera split off in a fairly compact group, with very little dimorphism, normally evittate abdominal pattern, palp-like postgonites with distinctly sclerotized aedeagus, a slender ninth sternum, and a broad unilobed surstylus. The *canicularis* subgroup has moderate dimorphism, a vittate abdominal pattern, heavily sclerotized postgonites, a broad ninth sternum, and a bilobed surstylus. The *glaucescens* subgroup is very heterogeneous, containing three species, of which *latifrons* is very similar to *Euryomma*, *laevis* somewhat resembles the *canicularis* subgroup, while *glaucescens* is quite distinct in certain respects, notably the structure of the postgonites, aedeagus, and fifth sternum.

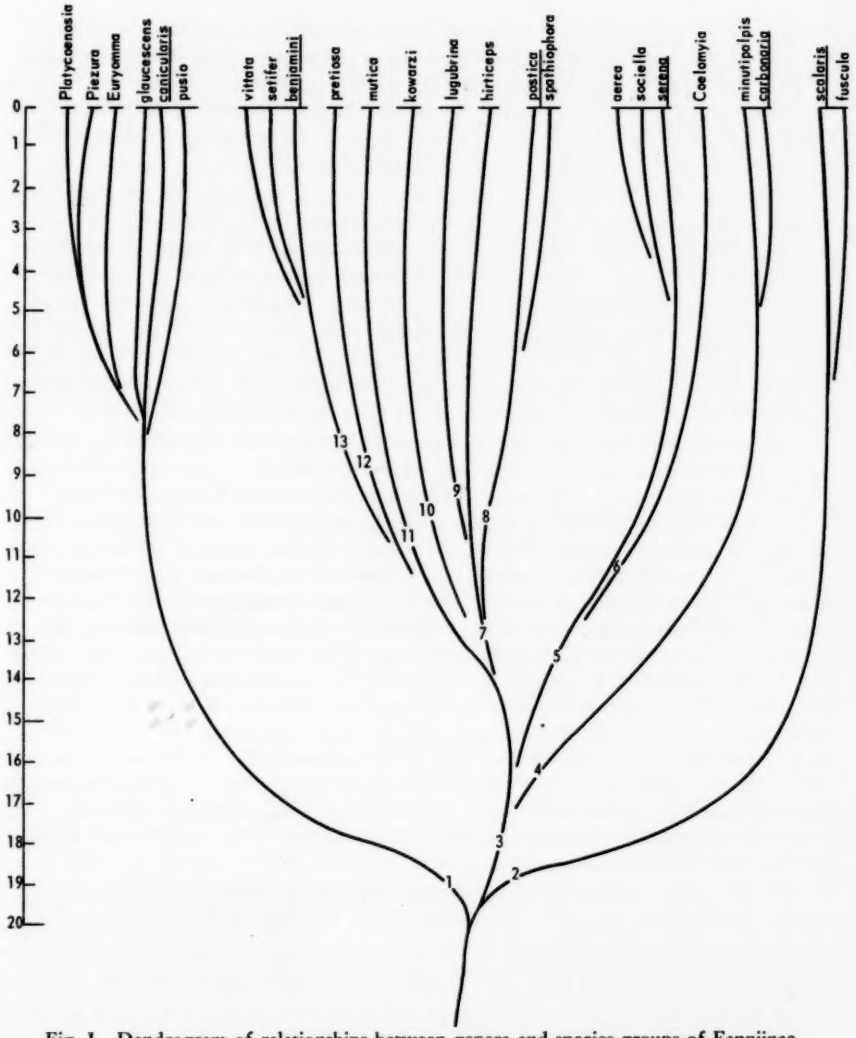


Fig. I. Dendrogram of relationships between genera and species groups of Fanniinae.

Special mention should be made of the taxonomic status of *Euryomma*, *Piezura*, and *Platycoenosia* in relation to this discussion. They were erected on the basis of a few striking characters, such as the presence of two pairs of orbitals in the male, a plumose arista, three sternopleural bristles, or a strong costal spine. Most of these characters were not included in the tabulation, and so their distinctness has been minimized. Nevertheless, it is unlikely they will warrant generic status when the entire subfamily is revised. I prefer to postpone any generic changes until a world revision permits a general reorganization of genera and species-groups.

The main stem of the subfamily (3) developed distinct dimorphism (losing both orbital bristles in the male), and from it split off the *scalaris* group (2),

which retained many primitive features (three spermathecae, primitive chaetotaxy, and spiralled bacilliform process) but contained the gene complexes which later developed the elaborate male characters of this group—bristle-brushes on the fore tibiae, thorn-like bristle clusters on the mid coxae and sternopleura, and crests on the mid tibiae. A later burst of genetic variation led to the elaborate genitalia and narrow female frons of the *fuscula* complex.

The next divergent line (4) led to the *carbonaria* group, with the development of broad female parafrontal, a swollen female theca, duplicated mid-tibial bristles (two to four on each surface), a cercal plate with lateroventral hooks, medially expanded surstyli, reduced bacilliform processes, and the loss of the third spermatheca. Much later it split into the two subgroups. The *minutipalpis* subgroup underwent a change to reduced palpi and small size, while retaining the hind-coxal bristles, pollinose integument, and a relatively primitive cercal plate; whereas the *carbonaria* subgroup lost the third-coxal bristles and developed glossy integument, an elaborate cercal plate, and a very broad female parafrontal.

The next divergent line (5) is characterized by the reduction (?) of the lower squama to a slender fringe, a tendency toward a cercal plate with a broadened and furcate apex, and a reduction of the spermathecae to two. In early forms, the surstylus had a lateral position, and the apex was truncate. From this line, a group diverged (6) which resulted in the genus *Coelomyia*, characterized by a retention of primitive form of theca, female parafrontals, and spermathecae, coupled with a loss of the bacilliform process and a broadening of the third and fourth segments of the abdomen with a consequent reduction in the sternites. The main line (5) continued, to give rise to the *serena* group, in which the female theca became swollen and glossy, the female parafrontals glossy or narrowed, and the spermathecae elongate and corrugated. The *serena* subgroup retained primitive structure to a large extent, while the other subgroups became more modified, with modified mid legs, a reduction of the bacilliform processes, and a short, broad fifth sternum. The *sociella* subgroup developed strongly bifurcate surstyli, while retaining a simple cercal plate; whereas the *aerea* subgroup developed a lobate cercal plate, variously modified surstyli, and slender female parafrontals.

The main stem of the genus continued virtually unchanged by the divergence of these specialized groups, so that most of the unusual characters developed by the above-mentioned groups can be found in one species or another derived from the main stem, indicating little loss of genetic variability up to this stage.

A distinct split appears to have been the next evolutionary step, with one line leading to *hirticeps* and relatives (7), another leading to *mutica* and relatives (11), and a third (10) leading to *kowarzi*.

The line leading to *hirticeps* (7) is characterized by the development of an elongate cercal plate and a variously modified theca, with a reduction of the spermathecae to two. The *postica* group (8) diverged from this line with the development of a glossy swollen female theca, more or less elongate and corrugated spermathecae, and the stabilization of the tibial bristles to single bristles on each surface. In addition, the cercal plate tended to become elongate, broadened medially and frequently concave dorsally. The *spathiophora* subgroup changed further by the development of a crest at the base of the mid-tibia and the reduction of the bacilliform processes and the bristling of the male hind femora. The main line (7) developed an elongate theca and broadened female parafrontals with a retention of simple spermathecae.

The line leading to *lugubrina* (9) is characterized by the development of an elongate, glossy theca and an apically broadened and bisetose cercal plate, with usually a ventral ridge of bristles on the mid metatarsus. It retained, however, the hind-coxal bristles, which are lost in the *postica* and *hirticeps* groups.

The *hirticeps* group retained many of the primitive characters but is quite heterogeneous in structural characters, indicating much more genetic variability than in the other groups.

The line leading to the *kowarzi* group (10) is represented by very few surviving species, but these have generally primitive chaetotaxy and female structural characters. In male structural characters it shows an independent line of development, with strongly lobate cercal plate and strikingly modified surstyli.

The remaining main line (11) retained a short cercal plate, simple theca, and two or more hind-tibial bristles. It leads directly to the *mutica* group, which is generally primitive, with the retention of three spermathecae, bristles on the hind coxae, and rows of bristles on the hind tibiae. It diverged from the other groups, however, in the development of a furcate, curved bacilliform process and the development of a strong prealar bristle.

The other two lines retained the spiralled bacilliform process. The *pretiosa* line (12) lost the hind-coxal bristles, retained the third spermatheca, and developed one or two strong prealars; whereas the *benjamini* line (13) lost the third spermatheca, retained the hind-coxal bristles, and developed only setulose prealars. The *benjamini* line developed in virtual isolation from its relatives in South America, and exhibits a wide divergence of evolutionary trends which is only very poorly represented in the Nearctic species of the group. The subgroups in this paper are only a crude approximation of the evolutionary divergence within this group.

BIOLOGY

Adult Habits

The species most familiar to the layman is *Fannia canicularis*, commonly called the little, or lesser, house fly. The species is virtually as synanthropous and cosmopolitan as *Musca domestica*, yet lacks the dependence of the latter on human habitation, having a very wide range of possible larval habitats. In subarctic regions it often replaces *Musca* and is the common house fly of Iceland. The adults normally comprise two to 25 per cent of the usual fly populations in houses (Hewitt, 1912) and up to 90 per cent of the fly populations in poultry and dairy barns (Smith, 1954a, 1954b; Tilden, 1954; Ogden and Kilpatrick, 1958), and in late fall (personal observations, Ottawa 1956) may make up to 100 per cent of the flies in upper-story rooms. They hover in loose swarms near the tops of buildings and enter open windows to hover with an irregular dancing flight around ceiling fixtures. These are their usual habits in all rooms of dwelling-places and barns; and they rarely have the annoying habit of settling on humans, tables, and food that is characteristic of *Musca domestica*. *Fannia scalaris* and *F. armata* are also found in houses in small numbers (Graham-Smith, 1916).

The common habit of the adults of *Fannia* is to hover outdoors near the lower branches of trees or, more rarely, in the open. These small swarms are usually mostly of males; the females are found in the lower vegetation, and can be collected by sweeping.

Both males and females are attracted to honey-dew, and often collect in large numbers on aphid-infested plants (Tiensuu, 1936). A second attraction to many species of *Fannia* is plant sap (Tiensuu, 1938; Shillito, 1947).

Several species are taken commonly on flowers, particularly on the blossoms of Umbelliferae (*Angelica, Archangelica*). Other records are from mesquite, flowering linden, ivy, *Salix, Taraxacum,* and *Solidago.*

Adults of the *hirticeps* group have been collected by me in large numbers around the edge of a muddy pond and from prairie sloughs. *F. postica* and *tuberculata* have been taken in Iceland from mossy areas and birch scrub (Nielsen et al., 1954), and I have seen *lugubrina, falcata,* and *tuberculata* in similar habitats in the subarctic regions of Canada.

F. benjamini is well known in western North America, as the females have the habit of buzzing annoyingly around ears and eyes, attracted by sweat and mucus. They have recently been cited as a vector of an eye-worm of mammals in California (Burnett et al., 1957).

The adults of several species of *Fannia* are known to be attracted to light traps in considerable numbers (Audcent, 1951; Parmenter, 1951; personal observation), and several species of the *canicularis, pretiosa, postica,* and *scalaris* groups have been taken from fly traps baited with excrement, carrion, and housefly attractants (Gill, 1955; collecting data).

Larval Habitats

The sources from which most of these data are compiled may be found in the Systematic section under the species referred to.

The most common larval habitat is in mushrooms and related fungi, particularly *Boletus* (*bovinus, tomentosus, edulis, badius, variegatus*), *Polyporus* (*sulphureus, versicolor,* and others), *Amanita* (*rubescens, phalloides*), *Amanitopsis vaginata, Coprinus attramentarius, Armillaria mellea, Clavaria stricta, Clitocybe* sp., *Agaricus* spp., *Lactarius deliciosus,* and *Entoloma lividum.* However, all these records concern the *mutica, scalaris,* and *canicularis* groups of *Fannia,* although *Platycoenosia mikii* also has been reared from a mushroom (*Cortinarius* sp.).

Rotting plant material is also frequently recorded as a larval habitat. *F. canicularis* is known from such diverse habitats as iris buds, cabbage stalks, plums, tomatoes, peas, grass, corn, onions, grass clippings, and rape stalks. *F. scalaris* is known from garbage and rotten potatoes, *manicata* from onions, and *pusio* from papaia stems, soured bread, and oat straw.

A related habitat—leaf mould and forest floor litter—is recorded for several species of *Fannia* (*curvipes, scalaris, canicularis,* and *brevipalpis*), while *macalpinei* has been reared from a punky poplar stump. This is probably the type of habitat of most boreal species of *Fannia* (of the *lugubrina, hirticeps, postica,* and *carbonaria* groups). *F. genualis* has been reared in Alaska from a lettuce garden.

Decaying animal matter (insects, snails, and vertebrates) is another frequently recorded habitat. *F. pusio* has been reared from dead cockroaches, Japanese beetles, rats, fish, and birds (Illingworth, 1917). *F. canicularis* and *scalaris* are commonly recorded from various species of snails, particularly of the genus *Helix.* Both species have been reared from mammalian corpses, along with *femoralis, howardi,* and *incisurata. F. snyderi* is recorded from a turtle, *spathiophora* from the entrails of a hare, and *canicularis* from decaying adult locusts. *F. canicularis* larvae have even been found in large numbers in nurseries where commercial fish meal was applied to the soil, and also in high-protein food waste.

There are several records of parasitism of insects, most of which are probably cases of introduction after the death of at least some of the insects. Records are from such diverse hosts as *Hyphantria cunea* (Dru.), *Vanessa atalanta* (L.),

Nygmia phaeorrhoea Don., *Dendrolimus pini* (L.), *Nymphalis polychloros* (L.), *Gymnancyla canella* (Hbn.), *Phyllophaga*, and *Lachnosterna*. However, a few records of predation are well substantiated. A large colony of both larvae and pupae of the elm leaf beetle (*Galerucella*) was wiped out by an infestation of *howardi* and *pusio* in a Washington, D.C., rearing experiment. *F. canicularis* is recorded as a predator of *Conotrachelus* larvae. *F. scalaris* has been recorded from living as well as dead snails.

Various species are recorded from excrement. *F. scalaris* is called the "latrine fly" from its preference for semiliquid excrement. *F. incisurata* is known from cesspools, while *howardi*, *pusio*, *armata*, *aethiops*, *fuscula*, *manicata*, and *canicularis* are known from human faeces. *F. scalaris* and *canicularis* are known from pig, chicken, and horse manure; *manicata* and *pusio* are also known from chicken manure; and *femoralis* from cow manure. *F. vespertilionis* is known from bat dung, *canicularis* from white-mouse dung, rabbit manure, and dog droppings; and *aerea* was reared from owl pellets.

Numerous species are known from bird, mammal, and hymenopteran (wasp and bee) nests, where they probably live on excrement and decaying organic matter. *F. vesparia* was reared from a nest of *Vespa germanica*, and *scalaris* from a hornets' nest. *F. canicularis* is known from the nests of various species of birds, as well as those of meadow mouse, deer mouse, squirrel, *Vespula germanica* (Fab.), and *Bombus terrestris* (L.). Other species from birds' nests include *snyderi*, *leucosticta*, *femoralis*, and *lineata* from starlings' nests, *scalaris* from pigeon, barn-swallow, and purple-martin nests, *incisurata* from a chickadee nest, *clara* from the nest of a little owl, *hirundinis* from a bank swallow's nest, *monilis* from a buzzard's nest, and *nidicola* from the nests of crested flycatcher, swallow, kingfisher, and arctic three-toed woodpecker. *F. nidica* has been reared from the nest of a song thrush, from an old bird's nest, and even from an artificial decoy nest. *F. latifrontalis* has been reared from a nest of *Lasius fuliginosus* Latr. and *hamata* from the nest of *Vespa crabro* L.

The last and most economically important habitat reported for *Fannia* is the occurrence of the larvae inside the human body. This is usually referred to as "myiasis" or "fanniasis". No attempt will be made here to go into details of clinical cases, which are recorded by James (1947) and in the various papers listed by him. *F. scalaris* and *canicularis* have both been frequently recorded in cases of intestinal, vesicular, and aural myiasis. *F. incisurata* has been recorded several times in connection with intestinal and aural myiasis, and *manicata* has been recorded in one case of intestinal myiasis. *F. canicularis* is the commonest species recorded in cases of vesicular myiasis, and there are two cases of cutaneous myiasis in monkeys credited to this species. It is also known to secondarily infest wool in Australia.

Life-History

The life-history is only known for a few economically important species, and most of the data is taken from reports on *canicularis* and *scalaris*.

These species may overwinter as active adults in warm rooms and stables (Wilhelmi, 1920) but commonly overwinter as puparia (less commonly as larvae) in the earth two to three inches below the surface or under shelter on the surface (Mellor, 1920). The adults emerge when the mean temperature reaches approximately 48°F, the males on the average emerging before the females (Graham-Smith, 1916). Greatest activity of the adults occurs at temperatures of about 75°F. (Nieschulz, 1935).

The eggs are deposited on the surface of the substrate (*canicularis* lays eggs both indoors and outdoors). The shortest life history (egg to adult) for *canicularis* was 18 days at 21-26°C. and 21 days at 18-23°C., and for *scalaris* 23 days at 18-23°C., both having been reared on pig-dung (Thomsen & Hammer, 1936). Roubaud (1927) states that *canicularis* has four generations a year, the first three without diapause, while the puparia of the fourth are affected by "diapause pseudo-hivernale" and overwinter in an inactive state. Kobayashi (1940) found considerable variation in emergence and attributed it to a prepupal diapause.

Whereas *canicularis* and *scalaris* usually leave semiliquid or liquid substrates for somewhat dryer places to pupate, *pusio* has no such habit, but pupates in the larval medium without any serious loss in viability (Illingworth, 1922).

On the basis of collecting data of the other species groups, it appears likely that most species of these (more boreal) groups have only one or two generations per year, with the spring emergence the more abundant of the two. Brauns (1950a) suggests that many species living in leaf litter overwinter as mature larvae.

The larvae go through three instars, which can be distinguished primarily by relative size and by the number of openings of the posterior spiracles (the number of openings equal to the number of instars). Inside the last larval skin, which hardens to form a rigid puparium, the pupa is formed.

Fannia canicularis and *scalaris* have been reared along with *Musca domestica* in artificial substrate mixtures and appear to thrive successfully on such media. Baits used for *Musca* also seem to attract *canicularis* and *scalaris*.

Predators

Members of the family Crabronidae (Hymenoptera) are recorded as predators of *Fannia* adults. *Thyreopus peltarius* Schreb. is recorded as a predator of *F. armata, Blepharipus pubescens* Schuck. as a predator of *F. polychaeta, B. leucostomus* L. as a predator of *F. polychaeta, armata, manicata,* and *similis,* and *Haplocrabro quadrimaculatus* Spin. as a predator of *F. canicularis, incisurata,* and *scalaris* (Hamm, 1926). *Scopeuma stercoraria* L. has also been recorded as a predator of *Fannia canicularis* (Hewitt, 1914).

Parasites

Fannia canicularis has been recorded as host for two parasitic Hymenoptera, *Synaldis concolor* Nees (Brauns, 1950) and *Aspilota nervosa* Hal., and three intestinal flagellates, *Herpetomonas muscaedomesticae* (Patton, 1921), *Rhynchoidomonas fanniae* Niesch., and *R. trajecti* Niesch. (Hennig, 1955). It is also known to be infested by one or more species of the fungus genus *Empusa* (Graham-Smith, 1916).

It has also been reported, along with *Fannia benjamini,* to contain developmental stages of *Thelazia californiensis* Price, an eye-worm (nematode) parasitic on mammals in California (Burnett et al., 1957).

ZOOGEOGRAPHY AND SPECIATION

Intercontinental Aspects

The Fanniinae are predominantly a temperate-zone group, the majority of species occurring in the Holarctic region with almost equal numbers in Eurasia and North America. A few species are known from Africa and India, and one from the Australasian region. Many species but only a small number of species groups are found in the Neotropical region.

The great diversity of species in the Palaearctic region indicates that this area may well have contained the origin of the subfamily, with considerable faunal interchange from very early times with the Nearctic region. At an early date, there must have been a limited interchange with the Neotropical region, leading to the great expansion of a few groups in that area.

The interrelations of the Nearctic and Palaearctic faunas are of particular interest to the present study. There appear to have been several periods of extensive interchange between the two areas, as the present faunal similarities indicate. Approximately 30 per cent of the species occurring in the Nearctic region are Holarctic in distribution, and another 25 per cent have close relatives in the Palaearctic region or among the Holarctic species.

It is also probable that there has been considerable recent speciation in the Nearctic region, as evidenced by the several Nearctic complexes of closely related and allopatric species.

Attesting to more ancient interchange are the Nearctic species groups which are scarcely or not at all represented in the Palaearctic region. The *Fannia pretiosa* group, with eight Nearctic species, has one fairly primitive species and one aberrant species in the Palaearctic region. The *Fannia benjamini* group, fairly closely related to, and probably stemming from, the *pretiosa* group, is entirely restricted to the Americas, with its greatest development in the tropics. The *Fannia pusio* group, and the genus *Euryomma*, are similarly prominent in the Neotropics and are known from only single, and apparently primitive, species in the Palaearctic region. All suggest a distinct break between the Old and New Worlds, without any recent interchange. It is significant that all these groups are Lower Austral to Neotropical in general distribution.

Between these two extremes are the vast majority of the species groups, with the included species occurring in roughly equal numbers in both regions and Nearctic and Palaearctic species showing only slight affinities below the species group level, indicating a moderately long independent history.

There is little doubt that the main, if not the only, route for faunal interchange in this group was across the Beringian land bridge, which acted as a filter of greater or lesser selectiveness. Almost all of the Holarctic species are either transcontinental (transamerican) or restricted to the northwestern portion of the Nearctic region.

Any attempt to estimate the main times of faunal interchange, and to relate these times to the movements of certain groups, must of necessity be highly speculative, since very few definite and unassailable facts have been established. In addition, the lack of fossils in this group, and of insects in general, prevents any definite dating of faunal interchanges.

However, evidence from the mammalian fossil record indicates maximum interchanges in the Pleistocene, late Miocene, late Eocene, and early Eocene. It is unlikely that the earliest of these was involved to any extent in the distribution of Fanniinae, but the other three may correlate with the indications of relationships mentioned earlier.

The last faunal interchange, during the Pleistocene, was undoubtedly greatly affected by the repeated glaciations of the north temperate regions, and sufficient time has elapsed, at least since early glacial periods, to allow speciation to occur. Thus we can fairly accurately attribute the Holarctic distribution pattern to the interchange of this epoch. It is also probable that the Nearctic species with very close relatives in the Palaearctic region have speciated, as a result of the isolation

and distributional alterations imposed by the glaciations, from forms arriving during the early periods of the Pleistocene.

For the intermediate degree of relationship shown in most of the species groups, it is reasonable to assume that speciation since the second period of interchange in late Miocene times may have continued to approximately the extent of differentiation shown.

This then would leave the period of the upper Eocene interchange as the main time for introduction of the *pusio* and *pretiosa* groups of *Fannia* and of the genus *Euryomma*, all of which have undergone extensive speciation in the New World, indicating a long period of independent development.

This is, of course, a great oversimplification of what probably occurred, since species and species groups do not necessarily evolve at the same rate, and a group showing considerable evolutionary divergence may have simply had a higher mutation rate or had more opportunities to diverge into new ecological niches. Thus the species of the *benjamini* group may have evolved in much less time than postulated, and a Miocene or even later interchange may be the correct time of introduction of the ancestral forms to this region. In the same way, what appear to be closely related species, because of a lack of differentiating characters, may actually have diverged much longer ago than postulated, and subsequently undergone a period of very slow evolution.

However, while these possibilities are present and must be taken into account in any detailed study of the evolution of smaller groups, it is conceivable that the overall history of the subfamily may be attributed to the pattern of faunal interchanges and subsequent speciation outlined above.

Nearctic Aspects

The majority of the Nearctic species of Fanniinae are northern and largely boreal in distribution, many of them ranging across the continent through the Canadian forest regions, while a considerable number are Holarctic. The two species groups which do not fit this generalization are in large part subtropical in distribution, and, in fact, include the majority of Neotropical Fanniinae. Nevertheless, some species (apparently more primitive) of both these groups have a boreal distribution pattern.

To a large extent the distribution patterns agree with the major vegetational regions of North America and indicate at least a partial dependence on the floral aspects of the habitat, although none of the species are known to be definitely associated with any particular plants.

There is a striking difference in the distribution in North America of the Holarctic and the strictly Nearctic species. Almost 80 per cent of the Holarctic species, but only 18 per cent of the Nearctic species, are transcontinental. Viewed in another way, of the species distributed right across North America, 63 per cent are Holarctic. This points up rather strongly the fact that most of the strictly Nearctic species are restricted in distribution, many of them occurring predominantly below the broad Canadian faunal zone, which apparently provides the main avenue for transcontinental distribution.

There are six main patterns of distribution apparent in the subfamily, and all but a few species have a known distribution which can be fitted into one of these patterns. The main exceptions are in the *serena* and *minutipalpis* subgroups, where several closely related species have apparently divided the main transcontinental area between them in various ways which only roughly approximate the main distribution patterns.

The basic distribution patterns can be designated as follows: 1, Transcontinental (Boreal and Transition life zones); 2, Cordilleran; 3, Carolinian-Alleghanian; 4, Beringian; 5, Labradorian; 6, Lower Austral. Each pattern will be discussed separately below.

1. Transcontinental pattern. This basic pattern, which is common to about a third of the species, covers the entire Boreal region (excluding the tundra) and most of the Transitional and Carolinian regions, with the usual extensions southwards along the mountain ranges where similar habitats occur. This main pattern can be divided into four subtypes.

The first subtype is common to five species, typified by *manicata* (Map 6) and *corvina* (Map 27), which are widespread throughout the entire area, restricted only by a dependence on forested habitats. All of the species are Holarctic, and range almost as widely in Europe.

The second subtype is shared by nine species, typified by *kowarzi* (Map 30) and *aethiops* (Map 25). Their range generally extends from treeline through the boreal regions to the southern limits of the Transition zone, although two species appear to be restricted to the Hudsonian zone. The group is predominantly Holarctic, with only two of the included species not yet recorded from the Palaearctic region.

The third subtype is common to 13 species, typified by *aerea* (Map 43), *genualis* (Map 14), and *enotahensis* (Map 5), and is restricted to a more or less central region roughly equivalent to the Canadian zone. Only about half (6) of the species are known to be Holarctic in distribution.

The fourth subtype is displayed by eight species, typified by *incisurata* (Map 1) and *fuscitibia* (Map 28), and extends through the southern half of the transcontinental region, comprising the Canadian, Alleghanian, and Carolinian zones. Of the eight species, only four are Holarctic, and all four are virtually cosmopolitan.

2. Cordilleran pattern. This pattern is the next most common type, if all species found only in the western mountain ranges are included, with 23 species, of which only seven appear to be distributed widely throughout the range. Ten are known from only a few localities in the southwest. Typical species are *flavibasis* (Map 21) and *ochrogaster* (Map 42). Only one species of this group, *serena* (Map 38), is Holarctic.

3. Carolinian-Alleghanian pattern. The species with this pattern occupy the eastern deciduous forest areas (southern hardwood forest), with extensions westwards along the river valleys. Seven species are included, all of which are strictly Nearctic, typified by *brevipalpis* (Map 29) and *nidicola* (Map 45).

4. Beringian pattern. A distribution related to the first two is displayed by six species occurring in southern Alaska and ranging eastward to a greater or lesser extent. Three of the six are known to be Holarctic, and it is probable that they all are. Typical species are *tuberculata* (Map 13) and *subpubescens* (Map 45). *Fannia serena*, mentioned under the Cordilleran species, might be considered to have an unusually extensive distribution of this type.

5. Labradorian pattern. This distribution covers the area of Labrador and northern Quebec, and is common to only two species, *abrupta* (Map 40) and *bradorei* (Map 38). Both are strictly Nearctic, the latter belonging to the *serena* complex which will be discussed later.

6. Lower Austral pattern. This pattern is less clear-cut than the previous ones, largely due to fewer collections from the south-central United States.

Four species are included, all strictly Nearctic, typified by *pusio* (Map 52) and *femoralis* (Map 53). These species are distributed across the southern half of the United States, apparently connected across the prairies by the scattered oak groves. It is possible that both *pellucida* and *americana* have this type of distribution, as records so far are from the Carolinian region and from California, with no records from the north central forests.

Species Complexes

The *serena* subgroup in North America is worthy of special attention, as the five species form a close complex and divide the continental area between them in a rather unique fashion (Maps 38, 39). *F. serena* is a Holarctic species which ranges in this country from Alaska to California and Colorado. Occurring from east-central Alaska south-eastwards to northern Alberta is the closely-related *intermedia*, which occurs sympatrically with *serena* in Alaska. In the eastern half of the continent are three species, closely related to the last two. In the north in the Canadian and Transition zones is *immaculata*, while to the south, but overlapping broadly with the previous species, is *meridionalis*. In the broad overlap zone, about 10 per cent of the specimens collected appear to be hybrids. To the northeast, in the Labrador region, occurs the fifth species, *bradorei*. The overall distribution of the complex is that of the fourth (southern) transcontinental group. The overlapping distributions of the species are unusual, and it is likely from the records of *meridionalis* in New Mexico that this species occurs in the northwest with *serena*, although the population may be connected with the main group through the southern states.

It is probable that early populations of this complex arrived in North America in early Pleistocene times and spread over the continent. Subsequent glaciations led to isolation and eventual speciation into the four Nearctic species, with the differentiation of *immaculata* and *meridionalis* not yet complete. A later immigration of *serena* into Alaska and its subsequent movement down the Cordilleran region resulted in the present pattern of the complex.

The *minutipalpis* subgroup is also of interest. In this case, four species have divided the transcontinental area among them, and all four are allopatric or have very narrow regions of sympatry (Map 29). In the northwest, in a very limited area of Alaska, is the Holarctic species *minutipalpis*. Along the west coast of the United States is a second species, *trigonifera*. A third species, *neopolychaeta*, occurs in the Cordilleran region and eastward through the Canadian zone as far as Minnesota. The fourth species, *brevipalpis*, is typically Carolinian in distribution. As a group, they are distributed over the entire deciduous forest region. Unlike the *serena* group, this complex has distinct morphological differences, particularly in the male genitalia, suggesting a moderately long period for evolution from an early common ancestor. *F. minutipalpis* is probably a fairly recent immigrant.

Unlike the two complexes mentioned previously, the three species of the *difficilis* complex appear to have identical distribution patterns (Map 46), with no indication of any division of the territory between them, except perhaps in relative abundance, with *difficilis* predominant in the east, *morrisoni* in the north, and *variabilis* in the west. Their sympatry is rather amazing, for the species can be told apart only with great difficulty.

There are three interesting cases of "species twins", in which there is one Holarctic and one Nearctic species which are very closely related. One such case is that of *fuscula* and *americana*. The two species have been confused for a

long time, and the females are still inseparable. The Holarctic *fuscula* is widespread across the transcontinental area, whereas the Nearctic *americana* is apparently Carolinian in distribution with some overlapping in the northeast with *fuscula*. However, two records of *americana* from California suggest an Austral distribution pattern for the species.

Another closely related and frequently confused pair are *manicata* and *enotahensis*. The former is a widespread transcontinental Holarctic species, the latter is restricted to the Canadian zone. There is apparently no distinct allopatry in this case, and there does not appear to be any difference in habitat.

The third pair, *incisurata* and *trianguligera*, are completely allopatric. *F. incisurata* has a Canadian zone Holarctic distribution, while *trianguligera* is restricted to the mountains of southwestern United States. Differences between the two species are rather minor. It would appear that *trianguligera* is a glacial relict forced southward during the Pleistocene, and prevented from a northward distribution at a later date either by discontinuity of its habitat or by competition with *incisurata*.

SUBFAMILY FANNIINAE

Taxonomic Status

The family and subfamily groupings of the calypterate Diptera have always been contentious, especially with respect to the Cordyluridae, Anthomyiidae, and Muscidae. The Cordyluridae have been considered a distinct family and have even been grouped with the acalypterates or (Enderlein, 1936) set off as a superfamily. Curran (1934) placed them in the Muscidae (s.l.), whereas Roback (1953) placed them as a subfamily of the Anthomyiidae (s.s.). Hennig (1955) treated them as a family.

The family names Anthomyiidae and Muscidae have been used by various authors for the same taxon. More recently the name Muscidae has come into common usage for the entire taxon including the Anthomyiidae, and the name Anthomyiidae has been restricted to the group in which the anal vein reaches the wing margin. This group has usually been treated as a subfamily, but both Roback and Hennig treated it as a family.

The generic group typified by *Fannia* was first raised to subfamily rank by Verrall (1901), and later to family rank by Schnabl and Dziedzicki (1911). However, it has generally been treated as a subfamily of the Muscidae, although Karl (1928) and Enderlein (1936) treated it as a tribe of the Phaoniinae. Roback raised it again to family rank after examining larval material.

I consider that our present lack of knowledge of relationships in these groups (as indicated by the variety of opinions among present-day workers) warrants the continued use of Muscidae (in the broad sense) with several subfamilies, following Curran (1934), van Emden in recent papers, and d'Assis-Fonseca (1956).

Whereas Roback's treatment of the Anthomyiinae and Scopeumatinae (Cordylurinae) as a family may eventually be proven correct, and the Fanniinae are no doubt a distinctive group, the separation of these groups at the family level only obscures the relationships of the other subfamilies of the Muscidae, and implies a much closer relationship between the subfamilies retained in the Muscidae (of Roback) than actually exists.

The Fanniinae are treated here as a subfamily, rather than as a tribe of the Phaoniinae, because of the striking differences in the male genitalia and the larval structure. As Roback has already mentioned, the Fanniinae are very close to

the Anthomyiinae in several important characters of the larval mouth-hooks, but the adult wing venation and leg characters clearly separate it from this group.

Diagnostic Characters

The Fanniinae are most easily recognized by the venation of the anal (vannal) portion of the wing. The first anal vein is very short, and the second curves strongly forward to intersect the first (if extended) at or before the margin of the wing. In *Azelia*, which has sometimes been included in the subfamily, the anal veins converge slightly, but the second curves outward again at its tip, so that the intersection would not occur before the wing margin (Fig. 258).

An excellent character in the males (except for a few Neotropical species) is the distinct mat of erect hairs on the ventral surface of the mid tibia. It is often reduced on the basal half of the tibia but the hairs are almost always distinct and long on the apical half. The tibia is also usually thickened on the apical half.

The females may be recognized by the broad parafrontals, which are convex on the inner margin or at least parallel-sided. In all other muscids the parafrontals are narrower medially than at the antennae or the ocellar triangle.

Characters of the subfamily which are partially distinctive (i.e., shared by some other groups in the Muscidae) are the presence of only two strong sternopleural bristles (in *Piezura* and *Platycoenosia* there is a weaker bristle between and slightly below the other two) and of a strong median dorsal bristle on the hind tibia.

The male genitalia also possess a few exclusive (though less easily visible) characters. A bacilliform process projects from the base of the cercal plate in all but the *canicularis* group of *Fannia* and the smaller genera. This process is apparently absent in all other muscids known to me. In addition, the ninth sternum is reduced medially, the pregonite is absent, and the postgonite is represented by a pair of membranous flaps or is elaborately modified into a horny structure surrounding the aedeagus. The aedeagus is almost entirely membranous except in the *glaucescens* subgroup of *Fannia* and in *Euryomma*, *Platycoenosia*, and *Piezura*.

The larvae are also very characteristic. A pair of laterodorsal processes on each segment, and three pairs on the terminal segment, distinguish this subfamily. The body shape is moderately flattened, the terminal segment strongly so. The posterior spiracles are raised on short stalks, and the spiracular slits are reduced to small circular openings. The mouth hooks are very similar to those of the Anthomyiinae, but the pharyngeal sclerites lack windows and are not flaring.

Five of the recognized genera of the subfamily are known from North America. *Xestomyia* (Tibet) and *Dasyphyma* (Chile), the latter not usually considered distinct from *Fannia*, are separated primarily by their metallic blue or green integumental color.

Key to Genera of Fanniinae

1. Arista plumose; sternopleuron usually with at least a weak third bristle between and slightly ventral to the other two 2
   Arista bare or pubescent; only two sternopleurals 3
2. Costal spine present at tip of subcosta; median sternopleural bristle weak; male with both pairs of orbital bristles ..... *Platycoenosia* Strobl
   Costal spine absent; median sternopleural bristle strong; male with only upper orbital bristles ..... *Piezura* Rondani
3. Oral margin projecting; abdomen broadest at posterior margin of elongate third segment, male with second segment at least half as long as broad, female with second and third segments subequal in length ..... *Coelomyia* Hal.

Oral margin not projecting; abdomen broadest at middle of second segment, the segment in male parallel sided on posterior half and never half as long as broad, in female distinctly longer than third segment 4

4. Imaginary extensions of anal veins meeting well before margin of wing (Fig. 260); first presutural dorsocentral usually over half as long as the second; male without lower orbital bristles ..... *Fannia* R.-D.

Imaginary extensions of anal veins meeting at or near margin of wing (Fig. 259); first presutural dorsocentral weak, less than half as long as second; male with lower orbital bristles ..... *Euryomma* Stein

GENUS *FANNIA* ROBINEAU-DESVOIDY

Fannia Robineau-Desvoidy, 1830, p. 567; Macquart, 1835, p. 333; Halliday, 1837, p. 150; Westwood, 1840, p. 143; Stein, 1907a, p. 656; Malloch, 1910, p. 67; Schnabl and Dziedzicki, 1911, p. 124; Malloch, 1912a, p. 133; Malloch, 1913a, p. 621; Stein, 1916, p. 75; Séguy, 1923, p. 258; Malloch, 1924a, p. 416 and 1924b, p. 515; Karl, 1928, p. 50; Malloch, 1934, p. 200; Ringdahl, 1934a, p. 106; Séguy, 1937, p. 160; Ringdahl, 1954a, p. 66; Hennig, 1955, p. 18. Type species: *Fannia saltatrix* Robineau-Desvoidy (= *scalaris* Fabricius), by monotypy.

Philinta Robineau-Desvoidy, 1830, p. 568; Haliday, 1837, p. 150; Westwood, 1840, p. 143. Type species: *Musca canicularis* Linné, designated by Séguy 1937, p. 161.

Aminta Robineau-Desvoidy, 1830, p. 569; Haliday, 1840, p. 143. Type species: *Aminta ludibunda* Robineau-Desvoidy (= *incisurata* Zetterstedt), designated by Coquillett, 1910, p. 505.

Homalomyia Bouché, 1834, p. 89; Westwood, 1840, p. 143; Schiner, 1862, p. 653; Loew, 1872, p. 93; Rondani, 1877, p. 42; Mrade, 1882, p. 201; Strobl, 1893, p. 237; Stein, 1895, p. 12; Stein, 1897, p. 170; van der Wulp, 1896, p. 331; Aldrich, 1905, p. 537; Strobl, 1909, p. 240. Type species: *Musca canicularis* Linné, designated by Westwood, 1840, p. 143.

Myantha Rondani, 1856, p. 95. Type species: *Musca canicularis* Linné, by monotypy.

Faunia Rondani, 1877, p. 42; Bigot, 1882, p. 17 (misspelling of *Fannia* Robineau-Desvoidy).

Dasyphyma Bigot, 1885, p. 268. Type species: *Dasyphyma armata* Bigot nec Meigen (= *errata* Malloch), by monotypy.

Homalomya Bigot, 1887, p. 29 (misspelling of *Homalomyia* Bouché).

Gymnochoristomma Strobl, 1900, p. 613. Type species: *Gymnochoristomma bosnica* (Strobl) (= *scalaris* Fabricius), by monotypy.

Steinomyia Malloch, 1912b, p. 656. Type species: *Steinomyia steini* Malloch (= *scalaris* Fabricius), by monotypy.

Fanniosoma Ringdahl, 1932, p. 610; Tiensuu, 1946b, p. 74; Ringdahl, 1952, p. 158; Ringdahl, 1954a, p. 79. Type species: *Fanniosoma latifrons* Ringdahl (= *latifrontalis* Hennig), by monotypy.

Beckerinella Enderlein, 1936, p. 195. Type species: *Beckerinella pygmaea* Enderlein (= *parva* Stein), by monotypy.

Profannia Séguy, 1937, p. 163. Type species: *Profannia parasitica* Séguy, by monotypy.

Ivalomyia Tiensuu, 1938, p. 29. Type species: *Ivalomyia limbata* Tiensuu, by monotypy.

This is the main genus of the subfamily, occurring throughout the world and comprising well over 200 species, the majority being from the Holarctic region.

It may be characterized as follows: Head with oral margin not protruding, male with at most one orbital bristle, arista bare or pubescent. Thorax usually with two strong presutural dorsocentrals and two sternopleurals (one anterior and one posterior). Wing with second anal vein strongly curved so as to intersect extension of first anal vein well before margin of wing, costal spine not developed. Abdomen broadest before posterior margin of second segment in male, second segment distinctly longer than third in female. Abdomen pollinose or, if glossy, not dark green. Male hypopygium usually with a distinct bacilliform process, the aedeagus variable in structure. Spermathecae two or three, the duct bases arising more or less at right angles.

In all other respects, including life-history and ecology, the genus appears to exhibit the entire range of variation of the subfamily.

Key to Groups and Subgroups[2]

(with references to the pertinent couplets in the male and female keys)

A. Hind coxae posteroventrally haired ..... B
Hind coxae posteroventrally bare ..... M

B. Abdomen trimaculate C
Abdomen vittate or unicolorous ..... F

C. Palpi and antennae black (all males, one female) ..... *pusio* subgroup: ♂, 4; ♀, 3
Palpi and basal antennal segments yellowish ..... *benjamini* group D

D. T_3 with several ad. bristles ..... *vittata* subgroup: ♂, 9; ♀, 5
T_3 with one ad. bristle ..... E

E. T_3 with 4 av. bristles, lower squama large and triangular ..... *setifer* subgroup: ♂, 10; ♀, 6
T_3 with 2 av. bristles, lower squama normal ..... *benjamini* subgroup: ♂, 11; ♀, 7

F. Prealar bristle not distinctly stronger than, nor set apart from, thoracic setulae; many T_3 av. bristles ..... *scalaris* subgroup: ♂, 17; ♀, 11
Prealar bristle differentiated and strong; or if setulose, well separated from other thoracic setulae ..... G

G. Theca slender, glossy, four times as long as broad ..... *lugubrina* group: ♂, 27; ♀, 17
Theca pollinose, or if glossy, swollen, distinctly less than four times as long as broad ..... H

H. Palpi reduced, half thecal length, T_2 bristles duplicated ..... *minutipalpis* subgroup: ♂, 32; ♀, 22
Palpi normal, T_2 bristles all single I

I. Male without sternopleural spine or T_3 posterior bristles, female parafacials setulose and parafrontals broad ..... *canicularis* group J
(if Mt_2 bears a ventral crest basally, see *hirticeps* group, S)
Male with either a ventral sternopleural spine or T_3 posterior bristles, female with parafacials bare and parafrontals narrow L

J. Prealar bristles small, setulose; flies less than 4 mm. long; female abdomen glossy ..... *pusio* subgroup: ♀, 33
Prealar bristles variable; flies usually more than 4 mm. long; female abdomen pollinose ..... K

K. T_2 with one av. and one ad. bristle; prealar bristles one or two; abdomen never yellowish ..... *glaucescens* subgroup: ♂, 44; ♀, 37
T_2 with more than one av. and ad.; if both single, abdomen yellowish ..... *canicularis* subgroup: ♂, 46; ♀, 39

L. Male with sternopleural spine present on ventral surface, female parafrontals narrow, T_3 avs. more than four ..... *fuscula* subgroup: ♂, 36; ♀, 27
Male with sternopleural spine absent, female parafrontals broader, T_3 avs. less than four ..... *mutica* group: ♂, 41; ♀, 30

M. Lower squama linear ..... *serena* group N
Lower squama at least weakly lobate ..... P

N. Acr. bristles evenly triserial, female parafrontals narrow ..... *aerea* subgroup: ♂, 58; ♀, 49
Acr. bristles biserial or weakly triserial, female parafrontals normal, broad ..... O

O. T_2 with either av. or ad. bristles duplicated; male F_2 with spinelike median av. bristles ..... *sociella* subgroup: ♂, 60; ♀, 51
T_2 with all bristles single; male F_2 avs. not strikingly developed ..... *serena* subgroup: ♂, 61; ♀, 52

P. Abdomen subshining bluish-black, female parafrontals glossy and very broad ..... *carbonaria* subgroup: ♂, 69; ♀, 57
Abdomen distinctly pollinose; female parafrontals pollinose, normal ..... Q

Q. All tibial bristles single ..... *postica* group R
At least some tibial bristles duplicated ..... S

R. Male F_2 av. bristles two to many, palpi of both sexes filiform ..... *postica* subgroup: ♂, 82; ♀, 65
Male F_2 av. bristles one, palpi of both sexes spatulate ..... *spathiophora* subgroup: ♂, 77; ♀, 67

S. T_2 with two or three ad. and pd. bristles ..... *hirticeps* group: ♂, 88; ♀, 72
T_2 with only one ad. bristle ..... T

T. T_2 with two pd. bristles ..... *kowarzi* group: ♂, 91; ♀, 75
T_2 with only one pd. bristle ..... *pretiosa* group: ♂, 92; ♀, 76
(if there are several T_3 ad. bristles, see *mutica* group, L)

[2]Abbreviations explained on page 45.

Key to Males of Nearctic Species

Abbreviations in standard usage for muscoid flies, explained more fully under "Diagnostic Characters . . .", are used throughout. The main ones are: C = coxa, F = femur, T = tibia, Mt = metatarsus, the subscripts 1, 2, and 3 referring respectively to fore, mid, and hind legs; av. = anteroventral (bristles, setulae, or hairs), ad. = anterodorsal, pd. = posterodorsal, pv. = posteroventral, pra. = prealar, acr. = acrostical.

1. Hind coxae posteroventrally haired or bristled 2
   Hind coxae posteroventrally bare 6
2. Abdomen with a median vitta and lateral maculations 3
   Abdomen with a triangulated or parallel-sided vitta 16
3. Palpi and antennae black 4
   Palpi and basal antennal segments yellowish 8
4. T_3 with numerous long av. and pv. hairlike bristles ..... *pusio* (Wiedemann) (p. 213)
   T_3 with only one av. and no pv. bristles 5
5. F_3 preapically swollen on the ventral surface 6
   F_3 tapered evenly preapically 7
6. Preapical av. bristles at least twice as long as femoral diameter, the swollen portion not constricted basad ..... *femoralis* (Stein) (p. 214)
   Preapical av. bristles only about as long as frontal diameter; swollen portion distinctly constricted basad, tuberculate in appearance ..... *snyderi* Seago (p. 217)
7. Hind femoral avs. of approximately equal length throughout *howardi* Malloch (p. 215)
   Hind femoral avs. with preapical bristle distinctly stronger than the others ..... *leucostica* (Meigen) (p. 218)
8. T_3 with several (two to five) ad. bristles 9
   T_3 with only a single ad. bristle 10
9. F_3 strongly clavate ..... *clavata*, new species (p. 163)
   F_3 normal in shape ..... *micheneri*, new species (p. 164)
10. Lower squama large, triangular; pregenital segment glossy *setifer*, new species (p. 162)
    Lower squama only slightly longer than upper, evenly rounded; pregenital segment pollinose 11
11. Third antennal segment black; thorax dark, not vittate ..... *benjamini* Malloch (p. 156)
    Third antennal segment basally yellow; thorax distinctly vittate 12
12. F_3 avs. with a distinct cluster of longer bristles medially, only one strong preapical bristle 13
    F_3 with two to four strong preapical av. bristles, no strong avs. medially 14
13. F_3 av. and pv. bristles at least as long as femoral diameter where situated ..... *conspicua* Malloch (p. 158)
    F_3 avs. and pvs. distinctly weaker, the pvs. never as long as femoral diameter ..... *neotomaria*, new species (p. 159)
14. F_3 with four strong preapical av. bristles ..... *operta*, new species (p. 160)
    F_3 with two (rarely three) strong preapical avs. 15
15. F_3 with four to six strong pv. bristles forming a tight cluster which does not grade into setulae basad ..... *arizonensis*, new species (p. 160)
    F_3 with four or five slender pvs. in a loose cluster which is continued basad as erect setulae ..... *arizonensis*, new species (p. 160)
16. Prealar bristle not differentiated from the numerous thoracic setulae, many T_3 avs. 17
    Prealar bristle distinctly stronger than the sparse thoracic setulae 26
17. C_3 with strong apical or preapical hooked bristle 18
    C_3 with only normal slender bristles 23
18. Two preapical hooked bristles on each coxa; T_2 with a strong glossy tubercle ..... *scalaris* (Fabricius) (p. 61)
    A single apical hooked bristle, T_3 not tuberculate 19
19. T_1 with a distinct posterior cluster of flattened bristles preapically 20
    T_1 with no such cluster 21
20. T_3 avs. twice as long as tibial diameter; pv. bristles absent *enotabensis* Seago (p. 68)
    T_3 avs. at most as long as tibial diameter; several pv. bristles ..... *manicata* (Meigen) (p. 69)
21. T_3 with four or five long dorsal bristles ..... *columbiana*, new species (p. 67)
    T_3 with only the median and preapical dorsal bristles 22
22. T_3 avs. and ads. long and slender, numerous ..... *ciliatissima*, new species (p. 65)
    T_3 avs. and ads. short, at most five on each surface ..... *atripes* (Stein) (p. 64)

23. Thorax dark brownish-black, squamae and wings infuscated 24
Thorax grey to dark greyish-brown, squamae and wings clear to yellowish 25
24. T_2 with a distinct glossy ventral tubercle ..... *coracina* (Loew) (p. 59)
T_2 without such a tubercle ..... *amosa*, new species (p. 60)
25. Thorax distinctly vittate; abdominal vitta equally expanded at anterior and posterior margins of each segment ..... *incisurata* (Zetterstedt) (p. 55)
Thorax dark, not vittate; abdominal vitta distinctly triangulated, not expanded at anterior margins ..... *trianguligera* Malloch (p. 58)
26. Theca slender, glossy, four times as long as broad 27
Theca pollinose; or if glossy, swollen 31
27. Pra. bristles absent, Mt_2 with no ventral ridge of fused bristles ..... *genualis* (Stein) (p. 89)
Pra. bristles two, Mt_2 with a ventral ridge 28
28. T_2 with a distinct ventral tubercle ..... *tuberculata* (Zetterstedt) (p. 88)
T_2 with no such tubercle 29
29. F_2 pvs. increasing apically, forming an open fascicle of long bristles on a distinct preapical tubercle ..... *lugubrina* (Zetterstedt) (p. 86)
F_2 pvs. short throughout, no distinct tubercle 30
30. T_1 with no ad., cercal plate short and truncated ..... *binei*, new species (p. 93)
T_1 with distinct ad., cercal plate elongate ..... *falcata*, new species (p. 91)
31. Palpi reduced to about half thecal length, T_2 bristles duplicated 32
Palpi normal, T_2 bristles all single 35
32. Abdominal vitta distinctly triangulated; abdomen slender, little over half as broad as long 33
Abdominal vitta parallel-sided; abdomen broad, two-thirds as broad as long 34
33. Frontal bristles seven to nine, postoccipital bristle row complete ..... *neopolychaeta*, new species (p. 136)
Frontal bristles 10 to 13, postoccipital bristle row absent on dorsal third ..... *trigonifera*, new species (p. 137)
34. Halteres dark brown, cercal plate swollen ..... *minutipalpis* (Stein) (p. 139)
Halteres yellow, cercal plate flattened ..... *brevipalpis*, new species (p. 133)
35. C_2 with a strong hooked bristle, sternopleuron with a strong ventral spine 36
C_2 and sternopleuron with only normal bristles 40
(if Mt_2 bears a basal ventral crest, continue at couplet 87)
36. Frontal vitta as broad as either parafrontal 37
Frontal vitta narrower than either parafrontal 38
37. T_2 avs. and pvs. at least twice as long as tibial diameter ..... *americana* Malloch (p. 75)
T_2 avs. and pvs. at most 1.5 times tibial diameter ..... *fuscula* (Fallén) (p. 72)
38. Abdomen largely yellow; tibiae reddish-yellow ..... *pellucida* (Stein) (p. 76)
Abdomen dark, distinctly pollinose; tibiae blackish 39
39. Squamae and halteres brown, F_2 pvs. long and slender ..... *presignis*, new species (p. 78)
Squamae and halteres yellowish, F_2 pvs. setulose ..... *vesparia* Meade (p. 77)
40. T_2 with bristles on basal two-thirds of posterior surface, no orbital bristle present 41
T_2 with no bristles on the posterior surface, upper orbital bristle present 43
41. Squamae dark yellow to brown, T_2 avs. one to three ..... *mutica* (Zetterstedt) (p. 80)
Squamae pale yellow, T_2 avs. three to five 42
42. Legs, at least tibiae, reddish; F_2 pvs. erect and long *oregonensis*, new species (p. 83)
Legs black; F_2 pvs. setulose, short ..... *immutica* Collin (p. 82)
43. Abdomen black, the vitta parallel-sided; T_2 bristles single 44
Abdominal vitta triangulated or T_2 bristles duplicated on either av. or ad. surfaces 46
44. Hypopygium greatly enlarged, fifth sternite produced into a strongly sclerotized triangle ..... *glaucescens* (Zetterstedt) (p. 206)
Hypopygium normal 45
45. Frontal vitta broad ..... *latifrons* Malloch (p. 210)
Front vitta narrow ..... *laevis* (Stein) (p. 208)
46. Abdomen entirely yellow, with only a weak vitta 47
Abdomen distinctly vittate; apical segments dark, heavily pollinose 48
47. Parafacials strongly setulose, T_2 bristles single ..... *binotata*, new species (p. 203)
Parafacials bare, T_2 bristles doubled ..... *ceringogaster*, new species (p. 202)
48. F_2 with many long hairlike pv. and ventral bristles, pra. bristles strong 49
F_2 with pvs. setulose, uniserial 54
49. Legs yellowish, T_2 avs. two to six 50
Legs black, T_2 avs. one or two 51

50. T_3 avs. four to six, abdomen basally yellowish, frontal vitta narrow ..... *pallidiventris* Malloch (p. 201)
T_3 avs. two, abdomen brownish-grey, frontal vitta broad ..... *tibialis* Malloch (p. 199)
51. Propleuron setulose 52
Propleuron bare 53
52. Parafacials bare, squamae clear yellowish ..... *difficilis* (Stein) (p. 195)
Parafacials dorsally setulose, squamae brownish ..... *variabilis*, new species (p. 196)
53. Abdomen entirely dark, heavily pollinose ..... *morrisoni* Malloch (p. 197)
Abdomen basally yellowish ..... *alaskensis*, new species (p. 198)
54. Parafacials setulose, parafrontals brownish-pollinose ..... *nidicola* Malloch (p. 192)
Parafacials bare, parafrontals silvery-pollinose 55
55. Thorax vittate, abdomen basally yellowish ..... *canicularis* (Linné) (p. 188)
Thorax not vittate, abdomen entirely dark, the pollen dense *subpubescens* Collin (p. 194)
56. Lower squama completely linear 57
Lower squama lobate on at least the inner edge 68
57. Acr. bristles evenly triserial 58
Acr. bristles biserial or weakly triserial, Mt_2 normal 59
58. Mt_2 with a basal crest, F_2 with no strong preapical av. ..... *aerea* (Zetterstedt) (p. 181)
Mt_2 unmodified, F_2 with a strong preapical av. ..... *serrata*, new species (p. 184)
59. F_2 avs. with three or four strong spines medially 60
F_2 avs. in an even row, not differentiated 61
60. T_3 with no av. or preapical dorsal bristle ..... *sociella* (Zetterstedt) (p. 177)
T_3 with several avs., preapical dorsal bristle present ..... *ochrogaster* (Thomson) (p. 179)
61. F_3 pvs. longer than femoral diameter preapically 62
F_3 pvs. setulose 63
62. Many postoccipital and stigmatal setulae, squamae and halteres yellowish-brown to dark brown ..... *abrupta* Malloch (p. 174)
Postoccipital and stigmatal setulae absent, squamae and halteres pale yellowish ..... *macalpinei*, new species (p. 175)
63. Postoccipital bristles present, occipital bristles long and irregular 64
Postoccipital bristles absent, occipital bristles variable 65
64. Abdomen bluish-grey-pollinose, the vitta parallel-sided and narrow ..... *intermedia*, new species (p. 168)
Abdomen dark-brown- to bluish-brown-pollinose, the vitta triangulated ..... *serena* (Fallén) (p. 167)
65. Occipital bristles short and regular, abdomen heavily brown-pollinose ..... *immaculata* Malloch (p. 169)
Occipital bristles long and irregular (at least near the ocellar triangle), abdominal pollen variable 66
66. Abdomen greyish-blue-pollinose, the vitta linear or almost entirely obscured ..... *meridionalis*, new species (p. 171)
Abdomen dark-brownish-pollinose, the vitta usually distinct 67
67. Parafrontals distinctly separated by a broad frontal vitta ..... *bradorei*, new species (p. 173)
Parafrontals contiguous ..... *serena* (Fallén) (p. 167)
68. Abdomen subshining bluish-black 69
Abdomen distinctly and heavily pollinose 75
69. Halteres brownish-black, several stigmatal setulae present ..... *corvina* (Verrall) (p. 130)
Halteres yellow, stigmatal setulae absent 70
70. F_3 pvs. setulose 71
F_3 pvs. long and erect, at least half as long as femoral diameter 74
71. Wings distinctly yellowish, the tips distinctly darkened 72
Wings clear 73
72. Lower squama distinctly projecting ..... *carbonaria* (Meigen) (p. 124)
Lower squama shorter than upper, not projecting ..... *melanura*, new species (p. 125)
73. Lower squama distinctly projecting; fifth abdominal segment pollinose ..... *borealis*, new species (p. 127)
Lower squama smaller than upper, not projecting; apical abdominal segments glossy ..... *fuscitibia* (Stein) (p. 132)
74. F_3 pvs. longest medially, becoming weaker apicad; antennae distinctly yellowish basally ..... *garretti*, new species (p. 128)
F_3 pvs. evenly increasing until longer than femoral diameter preapically, antennae rarely yellowish ..... *lucida*, new species (p. 129)

75. All tibial bristles single 76
At least some tibial bristles duplicated 87

76. F_3 with one preapical av. bristle 77
F_3 with two to many preapical av. bristles 82

77. T_1 with a row of long pv. hairlike bristles ..... *spathiophora* Malloch (p. 112)
T_1 with pv. surface bare 78

78. F_3 with only two preapical pv. bristles, no erect setulae basad ..... *scyphocerca*, new species (p. 118)
F_3 with several preapical pv. bristles 79

79. Postoccipital bristles and stigmatal setulae numerous, lower squama sublinear ..... *bigelowi*, new species (p. 115)
Postoccipitals and stigmatals absent 80

80. Frontal bristles four to six, restricted to anterior half of frontal area; lower squama projecting ..... *brooksi*, new species (p. 117)
Frontal bristles seven to 14, extending to the ocellar triangle; lower squama not projecting 81

81. F_3 with three to five strong preapical pv. bristles ..... *aethiops* Malloch (p. 120)
F_3 with about 10 strong preapical pv. bristles ..... *tundrarum*, new species (p. 116)

82. F_3 with two preapical av. bristles, Mt_2 crest strong 83
F_3 with several preapical av. bristles, Mt_2 crest usually weak or absent 84

83. Hypopygium broad, conspicuously swollen ..... *sequoiae*, new species (p. 112)
Hypopygium slender, not swollen ..... *flavibasis* (Stein) (p. 109)

84. F_3 av. bristles four or five, acr. bristles triserial postsuturally 85
F_3 av. bristles six or more, acr. bristles evenly biserial 86

85. F_3 pv. bristles usually six to eight, occipital bristles long dorsally ..... *enigmata*, new species (p. 107)
F_3 pv. bristles usually eight to 12, occipital bristles short and regular ..... *brevicauda*, new species (p. 106)

86. Mt_2 crest distinct, F_3 av. and pv. bristles apically curled *multisetosa*, new species (p. 108)
Mt_2 crest absent or very weak, F_3 bristles straight ..... *postica* (Stein) (p. 103)

87. T_2 with two or three ad. and pd. bristles, Mt_2 usually with a basal crest 88
T_2 with only one ad. bristle, Mt_2 unmodified 91

88. Eyes distinctly haired, Mt_2 crest much longer than broad 89
Eyes at most microscopically haired, Mt_2 crest weak or absent 90

89. T_3 with one av. bristle ..... *hirticeps* (Stein) (p. 96)
T_3 with three av. bristles ..... *lasiops* (Malloch) (p. 97)

90. Mt_2 crest absent, femur strongly arcuate ..... *atra* Stein (p. 100)
Mt_2 crest distinct, femur normal ..... *ungulata*, new species (p. 98)

91. F_3 with two pd. bristles ..... *kowarzi* (Verrall) (p. 140)
T_2 with one pd. bristle 92

92. F_3 strongly arcuate 93
F_3 normally developed 95

93. T_3 with a full row of weak ad. bristles ..... *arcuata*, new species (p. 152)
T_3 with only one ad. bristle 94

94. Abdomen and legs yellow, no pra. bristle ..... *curvipes* Malloch (p. 150)
Abdomen dark bluish-brown, legs largely black, two pra. bristles ..... *gilvitarsis*, new species (p. 153)

95. T_3 with three or four av. and ad. bristles ..... *depressa* (Stein) (p. 146)
(if several weak ad. bristles are present see *immutica*, p. 82)
T_3 with at most one ad. bristle 96

96. Abdomen, legs, and apex of scutellum yellow; one or two short pra. bristles ..... *penepretiosa*, new species (p. 144)
Never both legs and abdomen yellow, scutellum black; pra. one strong 97

97. Abdomen and legs black, several stigmatal setulae present, T_3 with two av. bristles ..... *elongata*, new species (p. 149)
Legs yellow, no stigmatal setulae, T_3 with three or four av. bristles 96

98. Abdomen black, bluish-grey-pollinose ..... *neomexicana*, new species (p. 147)
Abdomen basally translucent yellow ..... *leucogaster*, new species (p. 148)

Key to Females of Nearctic Species

1. Hind coxae posteroventrally haired 2
   Hind coxae posteroventrally bare 46
2. Abdomen trimaculate 3
   Abdomen unicolorous or with a median vitta 10
3. Palpi and antennae black; first three abdominal segments subshining black ..... *leucosticta* (Meigen) (p. 218)
   Palpi and antennae yellowish, at least basally; the second to fifth abdominal segments trimaculate 4
4. T_3 with two to four ad. bristles, lower squama large and triangular 5
   T_3 with only one ad. bristle, lower squama variable 6
5. Scutellum with lateral brown spots ..... ? *clavata*, new species (p. 163)[a]
   Scutellum with a broad basal brown band ..... ? *micheneri*, new species (p. 164)[a]
6. T_3 with four av. bristles, lower squama triangular ..... ? *setifer*, new species (p. 162)[a]
   T_3 with only two avs., lower squama rounded 7
7. Basal abdominal segments grey-pollinose, third antennal segment black 8
   Basal abdominal segments yellowish, third antennal segments yellowish basad 9
8. Femora largely infuscated, thorax largely dark brown ..... *operta*, new species (p. 160)
   Femora largely yellowish, thorax largely grey ..... *benjamini* Malloch (p. 156)
9. T_2 median bristles shorter than tibial diameter ..... *arizonensis*, new species (p. 160)
   T_2 median bristles longer than tibial diameter ..... *tescorum*, new species (p. 161)
   (*conspicua* and *neotomaria* also fall in this couplet)
10. Prealar bristle not differentiated from thoracic setulae, many T_3 av. setulae 11
    Prealar bristle distinctly stronger than thoracic setulae 16
11. T_1 ad. bristle present, thorax grey, not glossy 12
    T_1 ad. absent, or if present, the thorax subglossy black, and nonvittate 14
12. Basal ventral on F_2 weak, scutellum completely setulose ..... *incisurata* (Zetterstedt) (p. 55)
    Basal ventral on F_2 strong, scutellum basally bare 13
13. Thorax only faintly vittate, parafrontal setulae irregular ..... *trianguligera* Malloch (p. 58)
    Thorax distinctly vittate, parafrontal setulae uniserial ..... *scalaris* (Fabricius) (p. 61)
14. Palpi broadly spatulate ..... *robusta*, new species (p. 220)
    Palpi only weakly spatulate or linear 15
15. Thorax moderately pollinose, T_1 ad. usually present ..... *coracina* (Stein) (p. 59)
    Thorax subshining brownish-black, T_1 ad. usually absent ..... *manicata* complex (p. 64)
16. Theca slender, glossy, elongate 17
    Theca pollinose, or if glossy, swollen 21
17. Prealar bristle absent, T_3 av. bristle present ..... *genualis* (Stein) (p. 89)
    Prealar present, T_3 av. present or absent 18
18. Parafrontals and body subshining ..... *lugubrina* (Zetterstedt) (p. 86)
    Parafrontals and body distinctly grey-pollinose 19
19. T_3 av. present, F_2 with strong erect bristles ..... *tuberculata* (Zetterstedt) (p. 88)
    T_3 av. absent, F_2 bristles setulose 20
20. Tibiae distinctly yellowish, parafrontals densely pollinose *falcata*, new species (p. 91)
    Tibiae with at most the knees yellowish, parafrontals subshining *binei*, new species (p. 93)
21. Palpi reduced, half as long as theca (Fig. 268); T_2 bristles duplicated 22
    Palpi normal; T_2 bristles all single 25
22. Postoccipital row absent dorsally ..... *trigonifera*, new species (p. 137)
    Postoccipital row complete 23
23. Mesopleurals with only a few bristles strong anterodorsally ..... *neopolychaeta*, new species (p. 136)
    Mesopleurals with entire dorsal row strong and bristle-like 24
24. F_2 bristles long, erect, and bristle-like ..... *brevipalpis*, new species (p. 133)
    F_2 bristles weak, setulose basally ..... *minutipalpis* (Stein) (p. 139)
25. Parafacials bare, parafrontals less than one-third as broad as long 26
    Parafacials setulose, parafrontals normally broad 31
26. Parafrontals narrow and parallel-sided, T_3 av. bristles more than four 27
    Parafrontals broader, distinctly convex on the inner margin, T_3 av. bristles less than four 29
27. Abdomen yellow ..... *pellucida* (Stein) (p. 76)
    Abdomen dark, pollinose 28

[a] ? = female unknown, key characters derived from male.

28. Tibiae black ..... *presignis*, new species (p. 78)
Tibiae reddish to yellow 29
29. Eighth sternum well-developed ..... *fuscula* (Fallén) (p. 72)
Eighth sternum virtually absent ..... *americana* Malloch (p. 75)
30. T_3 av. bristle present, T_3 avs. one or two ..... *mutica* (Zetterstedt) (p. 80)
T_3 av. absent, T_3 avs. two to four 31
31. Postoccipital bristles absent dorsally, legs reddish ..... *oregonensis*, new species (p. 83)
Postoccipital bristles in a complete row, legs black ..... *immutica* Coll'n (p. 82)
32. Small, subglossy flies (less than 4 mm. long) 33
Pollinose flies or if glossy, distinctly more than 4 mm. long 36
33. Parafrontal distinctly glossy on inner half ..... *snyderi* Seago (p. 217)
Parafrontal evenly pollinose 34
34. Parafrontal pollen distinctly denser next the eyes ..... *pusio* (Wiedemann) (p. 213)
Parafrontal pollen more even, scarcely denser laterally 35
35. Predominantly northern ..... *howardi* Malloch (p. 215)
Predominantly southern ..... *femoralis* (Stein) (p. 214)
36. T_3 bristles single, pra. bristle strong, abdomen black 37
T_3 av. or ad. duplicated, if not, the pra. bristles setulose, or the abdomen yellowish ... 39
37. Subglossy flies, the parafrontals narrow ..... *glaucescens* (Zetterstedt) p. 206)
Pollinose flies, the parafrontals normally broad 38
38. Abdomen distinctly grey-pollinose, usually with a faint brown vitta ..... *laevis* (Stein) (p. 208)
Abdomen subshining, weakly pollinose, not vittate ..... *latifrons* Malloch (p. 210)
39. T_3 with several erect ad. bristles, prealar bristles setulose 40
T_3 with only one ad., pra. bristles strong 42
40. Abdomen basally yellow, if not, the thorax distinctly vittate ..... *canicularis* (Linné) (p. 188)
Abdomen unicolorous, thorax at most very weakly vittate 41
41. T_3 ads. almost complete (six or more), parafrontals irregular *nidicola* Malloch (p. 192)
T_3 ads. fewer (usually less than six), parafrontals uniserial *subpubescens* Coll'n (p. 194)
42. Legs yellow 43
Legs black 45
43. Abdomen black, frontal vitta very broad ..... *tibialis* Malloch (p. 199)
Abdomen broadly yellowish 44
44. T_3 with one av. bristle, femora dark, parafacials bristled *binotata*, new species (p. 203)
T_3 with three or four av. bristles, femora yellow, parafacials setulose ..... *pallidiventris* Malloch (p. 201)
45. Abdomen entirely yellow, palpi broadened ..... *ceringogaster*, new species (p. 202)
Abdomen at least apically black 47
46. Propleuron bare, abdomen entirely dark ..... *morrisoni* Malloch (p. 197)
Propleuron setulose, abdomen basally yellowed ..... *difficilis* (Stein) (p. 195); *variabilis*, new species (p. 196)
47. Lower squama linear 48
Lower squama at least weakly lobate 56
48. Acr. evenly triserial, parafrontals parallel-sided 49
Acr. biserial or weakly triserial 50
49. Pra. one, strong ..... *serrata*, new species (p. 184)
Pra. two, the posterior one weaker ..... *aerea* (Zetterstedt) (p. 181)
50. Either two T_3 avs. or ads.; abdomen usually at least basally yellowish 51
T_3 bristles single, abdomen black 52
51. Abdomen yellow; T_3 with two or three avs., one ad. ..... *ochrogaster* (Thomson) (p. 179)
Abdomen black or basally yellowed; T_3 with one av., two ads. ..... *sociella* (Zetterstedt) (p. 177)
52. Parafrontals glossy 53
Parafrontals at least weakly pollinose 54
53. Fifth abdominal segment largely pollinose, knees broadly yellowed, southern species ..... *meridionalis*, new species (p. 171)
Fifth segment largely glossy, knees only weakly yellowish, northern species ..... *immaculata* Malloch (p. 169); *bradorei*, new species (p. 173)
54. Parafrontals subshining ..... *serena* (Fallén) (p. 167); *intermedia*, new species (p. 168)
Parafrontals evenly pollinose 55
55. Several stigmatal setulae, postoccipital bristles present ..... *abrupta* Malloch (p. 174)
No stigmatal setulae, postoccipital bristles absent ..... *macalpinei*, new species (p. 175)

56. Parafrontals very broad, completely glossy 57
Parafrontals normal, pollinose 63
57. Wings yellow, tips distinctly brownish 58
Wings unicolorous, clear 59
58. T_3 with no pv., three pd. bristles; T_3 with two or three avs. ..... *carbonaria* (Meigen) (p. 124)
T_3 with one pv., two pds.; T_3 with three to five avs. ..... *melamura*, new species (p. 125)
59. Acr. triserial only on posterior fourth ..... *borealis*, new species (p. 127)
Acr. triserial from at least the thoracic suture 60
60. T_3 with three or four ads., last two abdominal segments almost completely glossy ..... *corvina* (Verrall) (p. 130)
T_3 with only two ads., usually with the fourth segment largely pollinose 61
61. T_3 with one av., lower squama not projecting ..... *fuscitibia* (Stein) (p. 132)
T_3 with one to three avs., lower squama at least weakly projecting 62
62. Palpi and base of antennae yellowish, legs at least faintly yellowish ..... *garretti*, new species (p. 128)
Palpi, antennae, and legs entirely black ..... *lucida*, new species (p. 129)
63. All tibial bristles single 64
At least some tibial bristles duplicated 71
64. Palpi filiform 65
Palpi at least weakly spatulate 67
65. Parafrontals sparsely pollinose, subshining ..... *postica* (Stein) (p. 103)
Parafrontals distinctly pollinose, not shining 66
66. Eighth sternum of ovipositor developed as a pair of projecting glossy swellings ..... *sequoiae*, new species (p. 112)
Eighth sternum normal, not glossy ..... *brevicauda*, new species (p. 106); *flavibasis* (Stein) (p. 109)
67. Palpi broadly spatulate ..... *spathiophora* Malloch (p. 112)
Palpi only weakly spatulate 68
68. Lower squama projecting, acr. strictly biserial ..... *brooksi*, new species (p. 117)
Lower squama not projecting, acr. variable 69
69. Acr. evenly triserial, several postoccipital bristles and stigmatal setulae present ..... *bigelowi*, new species (p. 115)
Acr. triserial only postsuturally, postoccipitals and stigmatals absent 70
70. Acr. strictly biserial, theca swollen, parafacials linear *scyphocerca*, new species (p. 118)
Acr. in part triserial, theca elongate, parafacials broad, distinctly visible in profile ..... *aethiops* Malloch (p. 120)
71. T_3 with two or three ad. and pd. bristles; parafrontals broad, the setulae at least irregularly biserial 72
T_3 with only one ad. bristle; parafrontals normal or narrowed, the setulae uniserial 75
72. Eyes with dense if rather short hairs, parafrontals dark pollinose 73
Eyes bare, parafrontals usually grey-pollinose 74
73. T_3 avs. one, second antennal segment with one strong bristle ..... *hirticeps* (Stein) (p. 96)
T_3 avs. two or three, second antennal segment with two strong bristles ..... *lasiops* Malloch (p. 97)
74. Postoccipital row present, T_3 avs. one ..... *ungulata*, new species (p. 98)
Postoccipital row absent, T_3 avs. usually two ..... ? *atra* (Stein) (p. 100)[3]
75. T_3 with two pd. bristles, T_3 avs. one, a row of postoccipital setulae present ..... *kowarzi* (Verrall) (p. 140)
T_3 with one pd. bristle, T_3 avs. usually two to five 76
76. T_3 with two ad. bristles, legs with at most the knees yellowish *depressa* (Stein) (p. 146)
T_3 with only one ad. bristle, legs variable in color, usually distinctly yellowish 77
77. Humeri and scutellum in part yellow ..... *penepretiosa*, new species (p. 144)
Humeri and scutellum black 78
78. Prealar bristles absent, abdomen yellow ..... *curvipes* Malloch (p. 150)
Prealars one or two, abdomen variable 79
79. Postoccipital bristles and stigmatal setulae present ..... *arcuata*, new species (p. 152)
Postoccipital and stigmatals absent 80
80. Legs entirely black ..... ? *elongata*, new species (p. 149)[3]
At least the tibiae yellowish 81

[3] ? = female unknown, key characters derived from male.

81. Femora yellow, abdomen largely black ..... *neomexicana*, new species (p. 147)
Femora largely infuscated, abdomen at least basally yellowish ..... *leucogaster*, new species (p. 148)

Key to Larvae of Fanniinae[4]

1. Posterior spiracles set well in from the margins of the caudal segment, anterior spiracles well-developed 2
Posterior spiracles set near to or on the lateral margins of the caudal segment, anterior spiracles usually small and inconspicuous 12
2. Posterior spiracular openings set well apart on finger-like processes; dorsal processes one to eight well-developed 3
Posterior spiracular openings close together; finger-like processes, if apparent, strongly fused together 7
3. Integument pebbled or finely spiculate, not smooth and reticulated ..... *Euryomma* spp.
Integument reticulated, not pebbled, rarely with weak spicules on interspaces of reticulate pattern 4
4. Dorsal processes as long as laterodorsal processes, projections of the laterodorsal processes distinctly furcate apically, integument with two or three spicules on each interspace (Fig. 284) ..... *Platycoenosia mikii* Strobl
Dorsal processes shorter than laterodorsal processes, projections of laterodorsals variable, integument with interspaces smooth 5
5. Sublateral processes on the caudal segment as long as the medials; mesothoracic processes as long as thoracic width ..... ?*F. fuscula* (Fallén)
Sublateral processes distinctly shorter than the medials, mesothoracic processes distinctly shorter than thoracic width 6
6. Dorsal processes almost as long as the laterodorsals, projections of laterodorsals short and not furcate (Fig. 283) ..... *F. canicularis* (Linné)
Dorsal processes much shorter than laterodorsals, projections of laterodorsals moderately long and furcate (Figs. 280-282) ..... *F. pusio* group
(No good specific characters known within the group)
7. Processes distinctly broadened at base, integument distinctly pebbled or almost smooth, not reticulate ..... *F. pretiosa* group 8
Processes not distinctly broadened at base, integument reticulate or plated, not pebbled ..... *F. scalaris* group 9
8. Lateral processes on anterior abdominal segments very short without distinct projections, integument almost smooth (Fig. 287) ..... *F. curvipes* Malloch
Lateral processes on anterior abdominal segments long with distinct trifurcate projections, integument distinctly pebbled (Fig. 288) ..... ?*F. arcuata*, new species
9. Mesothoracic (first) laterodorsal processes distinctly plumose, furcation of projections of laterodorsal processes well-developed (Fig. 285) ..... *F. incisurata* (Zetterstedt)
Mesothoracic laterodorsals not or scarcely plumose, furcation of projections weakly developed 10
10. Posterior spiracular stalk well-developed, spiracular openings well-separated, lateroventral processes well-developed (Fig. 273) ..... *F. scalaris* (Fabricius)
Posterior spiracular stalk not developed, spiracular openings close together, lateroventral processes weakly developed 11
11. Posterior spiracles only faintly raised above tergal surface, spiracles connected by a rounded ridge (Fig. 275) ..... *F. manicata* (Meigen)
Posterior spiracles distinctly raised above tergal surface, spiracles not connected by a raised line (Fig. 274) ..... *F. enotahensis* Seago
12. A distinct lateroventral process on the penultimate segment; only three processes on prothoracic spiracle; posterior spiracular stalk arising close to, but not on, lateral margin of segment (Fig. 278) ..... *F. benjamini* group 13
No distinct lateroventral process on the penultimate segment; either several or no distinct processes on prothoracic spiracle; posterior spiracular stalk marginal or nearly so 14
13. Three spiracular processes apparent on posterior spiracle, at least three pairs of distinct projections on processes of terminal segment (Fig. 289) ..... *F. benjamini* Malloch
Only two spiracular processes apparent on posterior spiracle; rarely more than one pair of distinct projections on processes of caudal segment (Fig. 278) ..... *F. neotomaria*, new species

[4]Completely reliable only for third instar larvae or puparia, although probably reasonably accurate for younger stages.

14. All laterodorsal processes distinctly plumose on at least basal half (Fig. 277) ..... ? *F. brevipalpis*, new species
Laterodorsal processes at most basally plumose 15
15. Laterodorsal processes only weakly developed, scarcely longer than wide, equally developed on caudal segment (from Nielsen et al., 1954) ..... ? *F. postica* (Stein)
Laterodorsal processes distinctly developed, basal processes of terminal segment longer than medial or apical processes 16
16. Prothoracic spiracle with short but distinct processes; integument patterned with rows of raised dots ..... *lugubrina* group 17
Prothoracic spiracle with no evident processes; integumental pattern with raised dots not forming a pattern (Fig. 279) ..... *F. macalpinei*. new species
17. Prothoracic segment with no distinct processes, mouth hooks well developed (Fig. 276) ..... *F. genualis* (Stein)
Prothoracic segment with distinct processes, mouth hooks reduced 18
18. Integument with raised spines near the mid-dorsal line, and in a row connecting posterior spiracles; median processes on terminal segment at least one-third as long as basal width of segment (Fig. 286) ..... ? *F. falcata*, new species
Integument probably without strong raised spines; median processes on terminal segment only about one-fourth as long as basal width of segment ..... *F. tuberculata* (Zetterstedt)
(from Nielsen et al., 1954)

scalaris group

This group is rather well defined, having no close relationship to other groups. The species are generally medium to large, with acrosticals at least triserial and with either numerous thoracic setulae covering the prealar area or strong sternopleural spines or both. The fore and mid tibiae are often modified, and the hind tibiae have several anterodorsal bristles and at least a partial row of anteroventrals.

There are two fairly distinct subgroups; the *scalaris* subgroup, with numerous thoracic setulae and no distinct prealar ones and with the tibiae often modified; and the *fuscula* subgroup, with usually a distinct prealar and fewer thoracic setulae and with a strong sternopleural spine (exclusive character of the group). In addition, the females of the *fuscula* subgroup usually have narrower parafrontals and frontal vitta than those of the *scalaris* subgroup.

Male

Head.—Frontal bristles six to 14, strong, if few, then numerous interstitials present. Parafrontals variable in width and coloration, separated by a distinct black frontal vitta. Parafacials without setulae. Occipital bristles usually long, slender, and even; rarely short (as noted in descriptions). Postoccipital bristles present or absent. Second antennal segment with one strong bristle, third normally twice as long as broad (shorter in *atripes*). Arista subpubescent. Palpus weakly spatulate; theca slender, pollinose, weakly sclerotized.

Thorax.—Dark, weakly to moderately pollinose, nonvittate or with four vittae between the bristle rows. Acr. bristles triserial to quadriserial presuturally, always partially quadriserial postsuturally. Accessory setulae numerous, intraalars numerous and extending over prealar area, and no distinct prealars in the *scalaris* subgroup; reduced in number, with intraalars at most triserial and prealars more or less well differentiated in the *fuscula* subgroup. Stigmatal setulae none to six. Mesopleural setulae variable. Sternopleuron in the *fuscula* subgroup with a strong spine of fused bristles ventrally (an exclusive character). Scutellum usually with many discal setulae. Lower squama usually the longer and distinctly projecting, rounded apically; squamae and haltere pale whitish to dark yellow-brown; wing clear.

Abdomen.—Normally three-fifths as broad as long, somewhat variable. Pollen usually dense, grey to dark brown, median vitta from almost parallel-sided (in *incisurata*) to strongly triangulated (usual condition).

Legs.—Black to entirely yellow. C_1 normal or with a strong flattened preapical ventral spine (exclusive character). F_1 pvs. usually weak basad. T_1 with or without an ad., with a preapical posterior cluster of scale-like bristles only in the *manicata* complex. C_2 with normal bristles or with a strong preapical (*scalaris*) or apical (most other species), hooked bristle which is usually large and flattened (exclusive character). F_2 avs. usually uniserial, strong and well-differentiated, pvs. usually well-differentiated, frequently strongly doubled ventrally and forming a strong preapical cluster. T_2 somewhat flattened on basal half, strongly enlarged on apical half (in *scalaris* and *coracina* with a strong, tubercular swelling); ventral mat usually even throughout, somewhat stronger and thicker on apical half; medially with one ad., one pd. Mt_2 normal. C_3 with one or two hairs posterodorsally. F_3 normal in shape; avs. with two to six strong preapicals, erect setulae basad; pvs. as erect setulae, none bristle-like, extending to apex. T_3 avs. from three or four medially to a full row; ads. from five medially to a full row, with usually one stronger bristle medially; pvs. from none to a full row of long, fine bristles.

Hypopygium.—Strikingly constant, with only minor variation, except for *fuscula* and *americana*, which have a strikingly different structure, and are discussed separately below. Cercal plate rather broad, short, well fused, and only moderately indented basally, evenly setulose, with stronger bristles apically. Surstylus extending from outer margin (a thin ribbon connecting it to inner margin) as a simple, curved blade with an expanded base. Bacilliform process distinctly spiralled, corkscrew-shaped. Ninth sternum simple; aedeagus membranous. Fifth sternum longer than broad, the bristles evenly distributed on medial portion, not crowded to posterior margin.

In *fuscula* and *americana*, the hypopygium is strikingly swollen, and considerably modified. Cercal plate slightly elongate, fused to base, and in *americana* with a pair of apical ventral processes. Surstylus swollen, preapically with a weakly to strongly developed outer ventral process. Ninth sternum moderately produced next to cercal plate and at lateral margins, in *americana* forming distinct hooks. Bacilliform process short and broad, not spiralled. Ninth sternum simple, slightly stronger around base of aedeagus; aedeagus weakly sclerotized. Fifth sternum broader than long, faintly produced sublaterally, the bristles fewer in number, shorter and stronger, somewhat crowded caudad.

Female

Coloration and pollinosity variable as in the male.

Head.—Parafrontals distinctly pollinose, normally one-third as broad as long (reduced in *fuscula* subgroup to as much as one-fourth as broad as long), setulae usually uniserial. Frontal vitta usually broad, narrow in the *fuscula* subgroup. A distinct reflecting spot on parafacials opposite antennal base; parafacials without setulae. Occipital bristles short, regular. Postoccipital bristles present or absent. Antenna and mouth parts as in male, palpus rarely spatulate.

Thorax.—As in the male.

Abdomen.—Unicolorous or with a faint dorsocentral vitta, evenly pollinose.

Legs.—C_1 normal. F_1 pvs. normally setulose on basal half, strong to base in some of the *fuscula* subgroup. T_1 normal. C_2 normally bristled. F_2 avs. in a

full row, stronger basally; pvs. with basal bristle distinct or not, setulose apicad. T_2 with one ad., one pd. (and one av. in *coracina*). C_3 setulose as in the male. F_3 with two or three preapical avs., basally setulose; pvs. setulose. T_3 with from three to a full row of avs., ad. row complete or partial (usually at least four); pvs. absent.

Ovipositor.—Subanal plate usually broader than long, discally bare in most species. Eighth sternum reduced to a pair of very small setulose plates, eighth tergum normal. Seventh segment unmodified. Sixth segment similar to seventh, tergum enclosing both apical spiracles, sixth spiracle set moderately in from anterior margin, seventh close to or just inside posterior margin of tergum. Spermathecae three, pear-shaped and smooth-surfaced or weakly elongate and distinctly corrugated, the apices distinctly indented. Duct base fairly short, moderately swollen, and slightly curved.

Larva

Integument reticulate, with fine depressed lines dividing the surface into smooth hexagonal areas; or (*incisurata*) smooth with numerous raised platelets. Laterodorsal processes strong, with distinctly trifurcate lateral projections on at least basal half (not strongly developed on thoracic segments except in *incisurata*), those on caudal segment subequal in length; lateroventral processes distinct on abdominal segments (including terminal segment); dorsal processes short or scarcely evident. Cephalic process of first thoracic segment very short. Anterior spiracular processes distinct, approximately eight in number. Posterior spiracular stalk situated on disc, short to very short, the spiracular processes radially arranged and very short, often fused together. Mouth hooks well-developed.

Based on numerous specimens (either third-instar larvae or puparia) and published data of *incisurata, scalaris, manicata,* and *enotahensis* and on published notes on *fuscula* and *hamata.*

scalaris subgroup

Fannia incisurata (Zetterstedt)

Figs. 1, 1A, 155, 285

Anthomyza incisurata Zetterstedt, 1838, p. 679.
Aricia incisurata, Zetterstedt, 1845, p. 1577; 1860, p. 6251.
Anthomyia incisurata, Walker, 1853, p. 142.
Homalomyia incisurata, Schiner, 1862, p. 656; Meade, 1878, p. 251; Hagen, 1881, p. 46; Meade, 1882, p. 202; Stein, 1895, p. 115; Stein, 1897, p. 171; Meade, 1897, p. 66; Pandellé, 1899, p. 188; Aldrich, 1905, p. 538; Wingate, 1905, p. 282.
Fannia incisurata, Stein, 1907a, p. 660; Strobl, 1909, p. 240; de Meijere, 1909, p. 57; Stein, 1910c, p. 98; Schnabl, 1911, p. 89; Malloch, 1912a, p. 206; Stein, 1913, p. 26; Kramer, 1917, p. 40; Stein, 1920, p. 45; Lesne, 1921, p. 53; Falcoz, 1923, p. 263; Séguy, 1923, p. 271, Fig. 530, 532; Séguy, 1924, p. 135; Malloch, 1924a, p. 419; Malloch, 1924b, p. 517; Collin, 1924, p. 205; Bezzi, 1925, p. 346; Séguy, 1925, p. 135; Charrier, 1927, p. 619-622; Ringdahl, 1928, p. 27; Karl, 1928, p. 59; Séguy, 1929, p. 71; Riedel, 1930, p. 79; Lindroth, 1931, p. 324; Audcent, 1932, p. 365; Malloch, 1934, p. 203; Tiensuu, 1935, p. 45; Frey, 1937, p. 134; Karl, 1937, p. 128; Aczél, 1938, p. 172; Ringdahl, 1944a, p. 17; James, 1947, p. 128; Frey, 1949, p. 105; Zangheri, 1950, p. 88; Ringdahl, 1951, p. 166; Ringdahl, 1952, p. 156; Ringdahl, 1954a, p. 72; Hennig, 1955, p. 51, Fig. 19; Reed, 1958, p. 239.
?Musca prostrata Scopoli, 1763, p. 328; Rossi, 1790, p. 308; syn. *teste* Rondani, 1877.
?Homalomyia prostrata, Rondani, 1866, p. 131; Rondani, 1877, p. 70.
Anthomyza impura Zetterstedt, 1338, p. 683; syn. *teste* Ringdahl, 1939.
Homalomyia hispanica Bigot, 1885, p. 283; syn. *teste* Stein, 1907.
Fannia vomitoria Dufour (in litt.); Séguy, 1925, p. 135; syn. *teste* Séguy, 1925.
Fannia pruinosa Shannon and Del Ponte, 1926, p. 512; syn. *teste* Malloch, 1934.

This species is primitive in many characters, and can be recognized thereby; the legs and sternopleuron lack special bristles, the stigmatal and postoccipital setulae are present, and the scutellar disc is completely setulose. The male is easily recognized by the grey-pollinose abdomen with the median vitta equally broadened at anterior and posterior margins of the segments. Length 5.5-7.0 mm.

Male

Head.–Frontal bristles six to nine, with several weak interstitials. Parafrontals silvery-pollinose, increasing from 0.06 mm. next ocellar triangle to 0.20 mm. at antenna, separated by a frontal vitta 0.10 mm. broad. Postoccipital bristles fine, irregularly biserial to verticals.

Thorax.–Dark greyish, with four darker brownish vittae, the outer two interrupted. Acr. triserial, median row irregular presuturally, quadriserial postsuturally. Accessory setulae numerous, intraalars numerous, extending laterally from the single, weakly differentiated prealar. Stigmatal setulae about six. Mesopleurals numerous, a few anterodorsally strong. Scutellar disc setulose to base. Squamae and haltere yellowish. Wing clear.

Abdomen.–2.2 by 4.0 mm. Grey-pollinose, median vitta black, parallel-sided or evenly expanded at either margin of each segment, obscured on fifth segment.

Legs.–Uniformly black. C_1 without spine. T_1 with distinct submedian ad. bristle. C_2 without spines. F_2 avs. in a single row of fine short bristles, closer together apically, rarely two or three basally distinctly stronger; pvs. in a strong row, as long as femoral width basally, decreasing evenly apicad, with a ventral row on median third. T_2 evenly thickened to apex, increasing to twice basal diameter; ventral hair mat short, dense, even throughout. F_3 avs. with erect setulae basad, four strong preapicals; pvs. as erect bristle-like setulae on basal three-fourths. T_3 avs. six or seven, strongest at two-thirds from base; a few strong, erect anterior bristles present; ads. a complete row of 12 with one stronger medially; pvs. four to six, long and erect, on median third.

Female

Head.–Normal, postoccipital setulae present as one irregular row.

Thorax.–Acr. usually triserial except on posterior fourth, more rarely quadriserial from suture. Stigmatal setulae usually absent. Otherwise as in male.

Abdomen.–Evenly grey-pollinose.

Legs.–F_2 avs. setulose, four or five stronger basad; pvs. with the basal strong. T_3 with three avs.; ads. with usually only one or two above the strong medial bristle.

Larva (Fig. 285)

Integument with numerous platelets slightly raised above otherwise smooth surface. Laterodorsal processes with long, slender, deeply trifurcate projections on basal half of each (on basal two-thirds of processes on last two thoracic segments); lateroventral processes distinct, with long trifurcate projections on posterior segments (processes of second thoracic segment extending at least to margins of segment); dorsal processes very short, apparent only as a button-like prominence; dorsolateral processes well developed, with about eight bifurcate projections. Posterior spiracular stalk moderately short, spiracular processes radially arranged and fused together.

Type locality and type

Pello, Torne Lappmark, Lappland, Sweden. Holotype male in the Zoologiska Institution, Lund, Sweden.

Remarks

The biology is similar to that of *scalaris;* the species has been reared from excrement and mammalian corpses (Lesne, 1921; Séguy, 1937), from a chickadee's nest (Falcoz, 1923), and from wasps' nests (Séguy, 1929, 1937). Hennig (1955) recorded a specimen labelled "ex *Hyphantria cunea*". The species has been implicated in cases of intestinal and aural myiasis (Lesne, 1921). Some specimens examined were collected from flowers of *Amelanchier canadensis* (L.) Medic and from tree trunks, and reared from *Polyporus* sp.

The species is almost cosmopolitan, being known in the Palaearctic region from northern Scandinavia to the Mediterranean, in north Africa and Asia minor, in the Canary Islands and the Azores; and in the east from the Urals, China, and Japan. Known also from South America. In this continent it is widespread south to Mexico, although rare in the western half of North America.

Records, 109 ♂♂, 34 ♀♀ (Map 1)

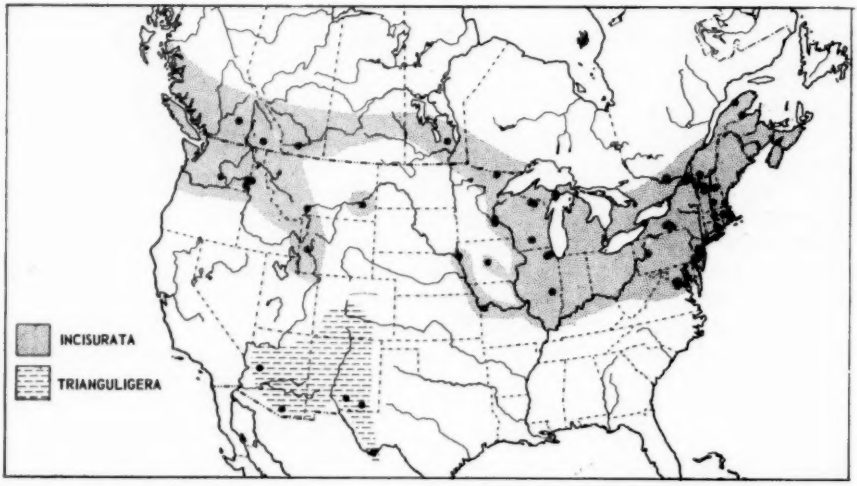
BRITISH COLUMBIA. Kaslo, 2 ♂♂, 2 ♀♀; Vernon, 2 ♀♀; Salmon Arm, 1 ♀; Departure Bay, 1 ♂. ALBERTA. Lethbridge, 1 ♀. WASHINGTON. Yakima, 1 ♂; Asotin, 1 ♀ (on trunk of cottonwood); Pullman, 3 ♂♂. IDAHO. Moscow, 1 ♂; Kamish (ex *Polyporus* sp.), 2 ♂♂. MONTANA. Bozeman (Expt. Sta.), 3 ♀♀; Miles City, 1 ♀. COLORADO. Paonia, 1 ♂. MANITOBA. Teulon, 1 ♂. MISSOURI. Atherton, 1 ♂. IOWA. Ames, 1 ♂; Sioux City, 1 ♂. MINNESOTA. St. Anthony Park, 3 ♂♂; Gray Cloud Is., 9 ♂♂, 12 ♀♀; St. Paul, 7 ♀♀; Cass Co., 1 ♀. WISCONSIN. Madison, 1 ♂. ILLINOIS. Urbana, 1 ♂, 1 ; Algonquin, 1 ♂; Chicago, 2 ♂♂. MICHIGAN. Schoolcraft Co., 1 ♂. PENNSYLVANIA. Swarthmore, 9 ♂♂, 1 ♀; Germantown, 1 ♂; Roxborough, 2 ♂♂. Delaware Co., 3 ♂♂; Philadelphia, 2 ♂♂; Natrona, 1 ♂. NEW JERSEY Shark R., 1 ♂; New Brunswick, 2 ♀♀. NEW YORK. Danby, 2 ♂♂; Ithaca, 1 ♂, 2 ♀♀; Flushing, 1 ♂; Albany, 1 ♂; Syosset, L.I., 1 ♂, 1 ♀; Little Neck L.I., 1 ♂; Suffolk Co., 2 ♂♂; Niagara Falls, 1 ♂. VIRGINIA. Falls Church, 3 ♂♂; Dead Run, Fairfax Co., 2 ♂♂. DISTRICT OF COLUMBIA. Washington, 6 ♂♂, 2 ♀♀. MASSACHUSETTS. Melrose Highlands, 1 ♂; Cambridge, 2 ♂♂; Holliston, 1 ♂; Cohasset, 1 ♂; New Bedford, 1 ♂; Amherst, 1 ♂, 2 ♀♀. CONNECTICUT. Lynne (ex bloom of *Amelanchier canadensis*), 1 ♂; no locality, 2 ♂♂. NEW HAMPSHIRE. White Mts., 2 ♂♂; Hampton, 2 ♂♂; Claremont, 1 ♂. VERMONT. St. Albans, 1 ♂; Stove, Mt. Mansfield, 2 ♂♂; Smuggler's Notch, 1 ♂. QUEBEC. Knowlton, 12 ♂♂; Hemmingford, 3 ♂♂, 3 ♀♀; Cross Point, 1 ♂; Old Chelsea, 1 ♂; Mt. St. Hilaire, 1 ♂; St. Anne de Monts, 1 ♂; Aylmer, 1 ♀; Champlain Lookout, Gatineau Park, 1 ♀; Cottage Beaulieu, 2 ♂♂; Rigaud, 1 ♂. ONTARIO. Ottawa, 1 ♀.

Collecting dates extend from April 5 to November 19, with the majority in June and July.

I have examined also 41 specimens from England, Germany, Austria, and Finland.

Notes on Synonymy

This species has been tentatively synonymized with *prostrata* Scopoli (1763) but the descriptions of the latter are much too vague and the type is lost. It has also been synonymized with *ludibunda* Robineau-Desvoidy (1830) although the



Map 1. Geographic distributions of *F. incisurata* (Zett.) and *F. trianguligera* Mall.

description of *ludibunda* mentions transverse abdominal markings. I consider them both *nomina dubia* and would remove *ludibunda* from the synonymy, leaving *incisurata* Zetterstedt (1838) the proper name for the species.

Fannia trianguligera Malloch

Figs. 2, 2A

Fannia trianguligera Malloch, 1918, p. 292.

This species is very close to the Holarctic species *incisurata*, but may be recognized by the nonvittate thorax, the distinctly triangulated abdominal median vitta, and the setulose hind-femoral posteroventrals. Length 5.5-6.5 mm.

Male

Head.—Frontal bristles seven to 10, several interstitials almost as strong as frontals. Parafrontals silvery, moderately narrow, increasing from 0.04 to 0.10 mm., separated by a frontal vitta 0.07 mm. broad. Occipital bristles short, regular. Postoccipital bristles in a fairly regular row, incomplete dorsally.

Thorax.—Dark-grey-pollinose, the vittae very faint. Pra. absent or no stronger than intraalar setulae. Bristles otherwise as described for *incisurata*, except that the scutellum is bare basally, and the stigmatal setulae are about 12.

Abdomen.—Broader than in *incisurata*, 2.0 by 3.0 mm. Grey-pollinose. Median vitta normally triangulated, strong.

Legs.—T_1 median ad. present but weak. F_2 avs. in a single row, strong, equal to femoral width basally, curled and strongly doubled ventrally on apical half. T_2 as described for *incisurata*. F_3 avs. with erect setulae basad, preapically with four strong; pvs. as fine, short setulae on basal half. T_3 avs. with only three or four medially, anteriors not evident; ads. a complete row of 12 with one stronger medially; pvs. four to six short fine bristles on median third.

Female

Head.—As described for *incisurata*, but with the parafrontal setulae irregularly biserial.

Thorax.—Acr. usually triserial, only faintly quadriserial postsuturally. Stigmatal setulae four to six. Otherwise as in male.

Abdomen.—As described for *incisurata.*

Legs.—As described for *incisurata,* but F_3 basal pv. weak and T_3 ad. row complete.

Type locality and type

Alamogordo, New Mexico. Holotype male in Academy of Natural Sciences, Philadelphia, No. 6207, examined February, 1956.

Records, 18 ♂♂, 5 ♀♀ (Map 1)

New Mexico. Alamogordo, 4 ♂♂, 3 ♀♀ (type series); Carlsbad Cavern, 1 ♂. Texas. Big Bend, 12 ♂♂, 1 ♀. Arizona. Santa Rita Mts., 1 ♂; Prescott, 1 ♀.

Collecting dates from May 7 to July 10.

Fannia coracina (Loew)

Figs. 3, 3A, 232

Homalomyia coracina Loew, 1873, p. 47; Stein, 1895, p. 80; Meade, 1897, p. 64; Pandellé, 1899, p. 187.

Fannia coracina, Stein, 1907a, p. 658; Strobl, 1910, p. 166; Schnabl, 1911, p. 89; Malloch, 1912a, p. 179; Stein, 1913, p. 25 (footnote); Ringdahl, 1914, p. 146; Stein, 1916, p. 81; Riedel, 1919, p. 166; Stein, 1920, p. 44; Séguy, 1923, p. 269, Figs. 528-9; Karl, 1928, p. 65; Riedel, 1930, p. 79; Thornley, 1931, p. 91; Audcent, 1932, p. 365; Ringdahl, 1934a, p. 115; Karl, 1937, p. 128; Tiensuu, 1939, p. 252; Ringdahl, 1950b, p. 117; Ringdahl, 1951, p. 167; Ringdahl, 1952, p. 156; Ringdahl, 1954a, p. 74; Hennig, 1955, p. 39, Fig. 23; Collin, 1958, p. 90.

Homalomyia spissata Meade, 1882, p. 203; syn. *teste* Stein, 1895.

Homalomyia armata Strobl (nec Meigen), 1893, p. 238; syn. *teste* Séguy, 1937, p. 166.

Fannia coracina var. *dimidiata* Strobl, 1910, p. 166.

This species has most of the primitive bristling of *incisurata,* but is easily separated by the presence of a mid-tibial tubercle, the blackish thorax and brownish-pollinose abdomen. It differs from *scalaris* in that the tubercle is longer and less glossy, and the mid coxa lacks hooked bristles. Length 4.0-6.5 mm.

Male

Head.—Frontal bristles 10 to 12, with many strong interstitials. Parafrontals brown-pollinose dorsad, very narrow (0.03 increasing to 0.06 mm.), separated by a narrow frontal vitta, 0.04 mm. broad. Postoccipital bristles fine, irregularly biserial to verticals.

Thorax.—Very dark brownish-black, nonvittate. Acr. triserial presuturally, quadriserial postsuturally. Accessory setulae long and fine, extending over prealar area, no distinct pra. Stigmatal setulae two to four. Mesopleurals numerous, a few anterodorsally strong. Scutellar disc bare medially. Squamae infuscated, margin brownish-yellow. Haltere yellow. Wing membrane infuscated.

Abdomen.—1.4 by 2.2 mm. Pollen very thick, obscuring the median vitta, brown-pollinose on first three segments, largely greyish-pollinose on fourth and fifth.

Legs.—Uniformly black. C_1 with only fine hairs ventrally. T_1 usually with a weak ad. C_2 without spine. F_2 avs. a single even row of short bristles; pvs. longer than femoral width basad, three or four fine basally, then strong, blunt-tipped, and shorter apicad, ventral row present only on median third. T_2

(Fig. 232) suddenly enlarged at two-thirds to form a glossy tubercle, gradually narrowing to apex; ventral mat absent except preapically. F_3 avs. with erect setulae, three or four strong preapically; pvs. erect, fine. T_3 as described for *incisurata*.

Female

Head.—Normal, postoccipital setulae present as one irregular row.

Thorax.—Acr. irregularly quadriserial. Several stigmatal setulae. Otherwise as in the male.

Abdomen.—Evenly grey-pollinose.

Legs.—F_2 avs. setulose, only faintly stronger basad; pvs. with basal strong, others long setulose, present only on basal two-thirds. T_2 with one ad., one pd. T_3 with two avs., a full row of ads. with one stronger.

Type locality and type

Herkulesbad ("Pannonia inferiori"). Type in the Zoologische Museum, Berlin, Germany.

Remarks

The species has been reared in association with *Neodiprion lecontei* (Fitch) and Strobl (1910) collected specimens (as *armata* Strobl, nec Meigen) from flowers of *Salvia glutinosa*.

The species is known in Europe from Lapland and Scotland south to Corsica and Hungary. In this country, it is known only from a few records scattered from California to Vermont. It is probably widely Holarctic but fairly rare, at least in the Nearctic region.

Records, 10 ♂♂, 1 ♀ (Map 2)

VERMONT. Jacksonville, 1 ♂. QUEBEC. Mt. Albert, 1 ♂; Laniel (ex *Neodiprion lecontei*), 1 ♂. ONTARIO. Chalk River, 3 ♂♂, 1 ♀. CONNECTICUT. Stamford, 1 ♂. MINNESOTA. St. Paul (ex farm fly trap), 1 ♂; Tenderfoot Lake, Vilas Co., 1 ♂. CALIFORNIA. Stanford University, 1 ♂.

Collecting dates from May 20 to October 7.

The North American material has been compared by the author with two specimens from England, and one from France.

***Fannia annosa*, new species**

This species belongs to the primitive *incisurata* complex with undifferentiated bristling and no hooked mid-coxal bristles. Its closest relative is probably *coracina*, from which it can be recognized by the lack of a tubercle on the mid tibia. Length 5.5 mm.

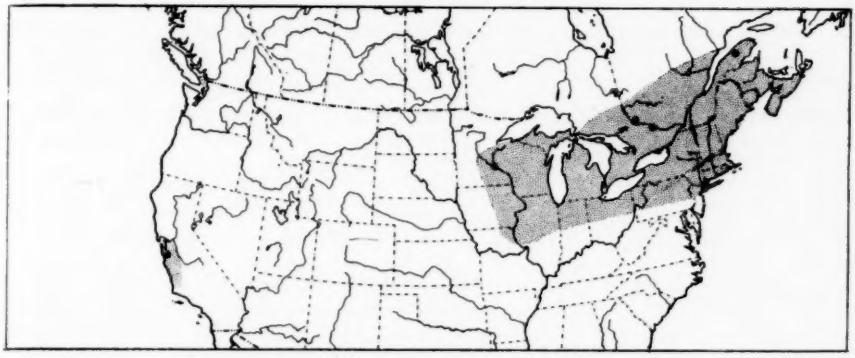
It differs from *coracina* as follows:

Male

Head.—Parafrontals narrow (0.02 increasing to 0.05 mm.), frontal vitta only 0.02 mm. wide.

Thorax.—Acr. irregularly quadriserial throughout. Stigmatal setulae numerous. Haltere brownish-yellow. Wing membrane faintly infuscated.

Abdomen.—2.0 (flattened) by 2.8 mm. Bluish-brown-pollinose (becoming more bluish caudad), median vitta moderately distinct and parallel-sided.



Map 2. Geographic distribution of *F. coracina* (Loew).

Legs.–F_2 avs. in a single row, as long as femoral diameter basally, decreasing evenly to apex, with a short break preapically; pvs. very long and slender basally, becoming shorter and stronger, stopping at three-fourths from base where they are slightly shorter than femoral diameter; duplicated ventrally on median half. T_2 slender on basal two-thirds, then suddenly but weakly thickened on apical third; ventral mat very short, evident only on apical half.

Hypopygium.–Very similar to others of the *scalaris* group, no distinguishing characters.

Female

Not as yet known.

Type

Holotype.– ♂, West side of Cortes Pass (11,000 ft.), Mexico, Mexico, 13.VIII.1954 (J. G. Chillcott) (C.N.C. No. 6686).

***Fannia scalaris* (Fabricius)**

Figs. 4, 4A, 222, 233, 273

Musca scalaris Fabricius, 1794, p. 332; Fabricius, 1805, p. 305; Fallén, 1824, p. 69.
Anthomyia scalaris, Meigen, 1826, p. 141; Macquart, 1835, p. 333; Taschenberg, 1880, p. 134.
Anthomyia scalaris, Zetterstedt, 1838, p. 681.
Aricia scalaris, Zetterstedt, 1845, p. 1575.
Homalomyia scalaris, Schiner, 1862, p. 654; Rondani, 1866, p. 131; 1877, p. 55; Meade, 1878, p. 251; Hagen, 1881, p. 45; Meade, 1882, p. 202; Stein, 1895, p. 46; Stein, 1897, p. 171; Meade, 1897, p. 63; Pandellé, 1899, p. 186; Howard, 1900, p. 582; Aldrich, 1905, p. 539; Wingate, 1906, p. 279.
Fannia scalaris, Stein, 1907a, p. 664; Strobl, 1909, p. 240; Stein, 1910c, p. 99; Villeneuve, 1910, p. 79; Schnabl, 1911, p. 89; Malloch, 1912a, p. 160; Hewitt, 1912a, p. 161; Stein, 1913, p. 26; Graham-Smith, 1914, p. 33; Hewitt, 1914b, p. 193; Stein, 1915b, p. 136; Graham-Smith, 1916, p. 440; Buchanan, 1916, p. 1; Atkinson, 1916, p. 142; Lodge, 1916, p. 481; Place, 1916, p. 6; Stein, 1916, p. 81; Foreman and Graham-Smith, 1917, p. 109; Lodge, 1918, p. 141; Stein, 1920, p. 45; Lesne, 1921, p. 53; Mokrzecki, 1923, p. 135; Séguy, 1923, p. 273, Figs. 501, 533; Malloch, 1924a, p. 416; Malloch, 1924b, p. 517; Séguy, 1925, p. 135; Forsius, 1925, p. 50; Bonnamour, 1926, p. 85; Illingsworth, 1926a, p. 260; Fischer, 1926, p. 399; Vitzthum, 1926, p. 46; Karl, 1928, p. 56; Ringdahl, 1928, p. 25; Goetghebuer, 1929, p. 237; Séguy, 1929, p. 71; Kobayashi, 1930, p. 186; Séguy, 1930, p. 158; Lindroth, 1931, p. 324; Audcent, 1932, p. 365; Natvig, 1932, p. 117; Lundblad, 1933, p. 28; Stackelberg, 1933, p. 524; Malloch, 1934, p. 203; Tiensuu, 1935, p. 45; Séguy, 1935, p. 159; Karl, 1935, p. 40; Thomsen and Hammer, 1936, p. 559; Peus, 1936, p. 141; Frey, 1937, p. 134; Lörincz and

Mihályi, 1938, p. 1; Aczél, 1938. p. 172; Baranov, 1939, p. 280; Aczél, 1940, p. 33; Derbeneva-Ukhova, 1940, p. 323; Séguy, 1941a, p. 23; Ringdahl, 1944a, p. 17; James, 1947. p. 127; Frey, 1950, p. 33; Ringdahl, 1951, p. 166; Ringdahl, 1952, p. 158; Hennig, 1952, p. 387, Figs. 5, 11, 14; Ringdahl, 1954a, p. 72; Hennig, 1955, p. 81, Figs. 16, 67; Tilden, 1957, p. 24.

Fannia saltatrix Robineau-Desvoidy, 1830, p. 567; Séguy, 1925, p. 135; syn. *teste* Stein, 1907a.
Anthomyia pini Hartig, 1838, p. 302; Ratzeburg, 1844, p. 170; syn. *teste* Stein, 1907a.
?Anthomyia elapsa Walker, 1853, p. 136; syn. *teste* Stein, 1907a.
Anthomyia subnitida Macquart, 1858, p. 265; syn. *teste* Stein, 1907a.
Homalomyia bosnica Strobl, 1896, p. 462; syn. *teste* Villeneuve, 1910.
Gymnochoristomma bosnica, Strobl, 1900, p. 613.
Steinomyia steini Malloch, 1912b, p. 657; syn. *teste* Malloch, 1934.

This is the type species of *Fannia*, and is a truly characteristic form. Many of its characters are primitive, yet in mid-coxal bristling and mid-tibial structure it is unique in the Nearctic region. There are two species (*rabdionata* and *pseudoscalaris*) in the Palaearctic region, which appear to be closely related, but each is known only from the original description. Length 5.5-7.5 mm.

Male

Head.—Frontal bristles nine to 12, the interstitials strong. Parafrontals silvery, distinctly increasing apicad from 0.06 to 0.15 mm., separated by a distinct black frontal vitta (0.08 mm. wide). Parafacials broad. Postoccipital bristles fine, irregularly biserial to verticals.

Thorax.—Practically identical with *incisurata*, thoracic setulae somewhat sparser, and disc of scutellum basally bare.

Abdomen.—Like *incisurata* in structure and pollinosity, but the median vitta never expanded on anterior margins, but broadly expanded at the posterior margins of the segments.

Legs.—C_1 with a strong but unflattened, distinctly preapical ventral bristle. T_1 with no ad. bristle, apically with an inner patch of black setulae. C_2 with two strong hooked bristles laterad, and a strong vaguely hooked apical bristle. F_2 avs. two-thirds as long as femoral width basally, with five widely spaced on basal half, then five closer-spaced to two-thirds, a break, and 12 in a preapical comb; pvs. longer than femoral width basally, medially two-thirds as long, with a strong ventral clump of bristles at the middle, changing to a single row on each end. T_2 (Fig. 233) with a strong triangulated crest on apical half, broadly glossy on its outer margin; ventral mat negligible, scarcely visible except preapically. F_3 with two or three preapical avs. strong, with erect setulae basad; pvs. with a row of prostrate setulae to apex. T_3 with three or four median avs., a few erect anterior setulae, a full row of ads., and four or five erect median pv. setulae.

Female

Almost identical with *incisurata*, separated primarily by the basally bare scutellar disc, several stigmatal setulae and more distinctly quadriserial acrosticals. Basal mid-femoral posteroventral bristle strong, and hind-tibial anterodorsal row usually complete. Separable from all related forms by the combination of distinctly vittate thorax and strong basal mid-femoral bristle.

Larva (Fig. 273)

Laterodorsal processes except on thoracic segments with short, slender, bifurcate or weakly trifurcate projections on basal half of each; those on thoracic segments bare; lateroventral processes distinct, with short bifurcate processes on posterior segments (processes of second thoracic segment very short but distinct); dorsal processes moderate in length, as long as distance from base to mid-line of

dorsum; dorsolateral processes with only about three simple projections. Posterior spiracular stalk moderately short, spiracular processes slightly separated, without distinct radial grouping.

Description based on several larvae and associated puparia from North America and four puparia from Europe, as well as published descriptions and figures.

Type locality and type

Hafnia, Denmark. The type is not known with certainty. There are two specimens among the Fabrician material in Copenhagen which agree with the description, one in excellent condition and unlabelled, and one in poorer condition labelled "*M. scalaris*" (from notes taken by J. R. Vockeroth, 1954). It is certain that these specimens are part of the original type material, and one should eventually be designated as lectotype.

Remarks

This species is apparently cosmopolitan, having been recorded from all major faunal areas, excluding the truly tropical and arctic areas. In the Nearctic region it is known from the Gulf of Mexico north to the limits of the Canadian zone.

It is equally unrestricted in habitat requirements, having been recorded from almost every habitat known for the genus. It is commonly referred to as the "latrine fly", indicating the prevalence of the adults around privies and excrement.

The species has been reared from fungi: *Boletus badius* Fr. and *Lactarius deliciosus* (L.) Fr. (Hennig, 1955), *B. edulis* (Bull.) Fr. (Bonnamour, 1926), and *Polyporus* sp. (Stein, 1920); from wasps' nests: *Vespula vulgaris* (L.) (Vitzhum, 1927) and *Vespa crabro* L. (Hennig, 1955); from birds' nests: pigeon, barn swallow, and house martin (Séguy, 1927); swallow, sparrow, titmouse, and nightingale (Séguy, 1946); and purple martin (Eichler, 1937); from dead and living land snails (Séguy, 1937; Mokrzecki, 1923); from dung (Thomsen and Hammer, 1936), manure (Mellor, 1920), and cesspools (Lesne, 1921); and as a parasite (?) of *Pyrameis* (= *Vanessa*) *atalanta* (L.) (Séguy, 1923) and *Bombyx* (= *Dendrolimus*) *pini* (L.) (Hartig, 1838).

It has been implicated in several cases of intestinal, aural, and vesicular myiasis (James, 1947; Forsius, 1925; Goetghebuer, 1929; Natvig, 1932).

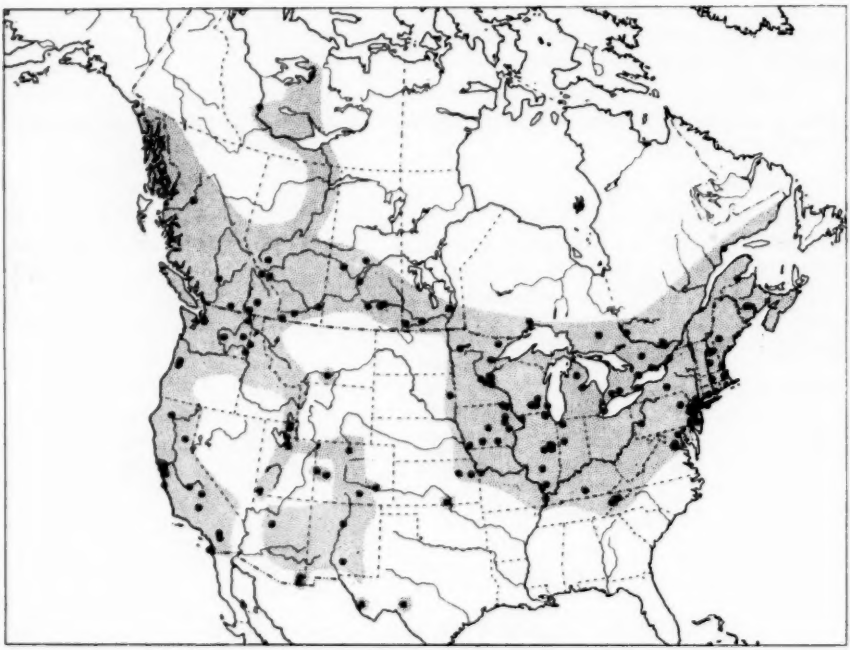
The adults are attracted to light (Parmenter, 1951) and to carcasses (Illingworth, 1926b); and have been taken on aphid-infested plants (Tiensuu, 1936). They are not uncommon in houses.

Specimens before me have been reared from excrement, in the burrow of a ground hog, and from garbage, rotten potatoes, and onions. They have also been taken at light and in baited traps.

Records (Map 3)

This species occurs in all the states and provinces of America north of Mexico but I have not as yet seen specimens from Mexico. Since it is common, and the material before me does not indicate any preferred areas in the inhabited parts of the region, I have omitted the usual data on sex, number, and locality, except for the following far-northern records: NORTHWEST TERRITORIES. Great Bear Lake, 1 ♀; Fort Wrigley, 1 ♀. ALASKA. Naknek, 1 ♀; Fort Richardson, 1 ♀.

I have also seen 58 specimens from China, Japan, Korea, Africa, and Europe.



Map 3. Geographic distribution of *F. scalaris* (Fab.).

Fannia atripes Stein

Figs. 5, 5A, 156, 223

Fannia atripes Stein, 1916, p. 80; Karl, 1928, p. 57; Karl, 1937, p. 128; Collin, 1939, p. 145; Hennig, 1955, p. 29, Fig. 24; Collin, 1958, p. 91.

This species appears to be the most primitive member of the *manicata* complex, which is characterized by having fore- and mid-coxal spines. The species can be recognized by the normal fore and mid tibiae, and the small number of hind-tibial anteroventral bristles. Length 3.5-4.5 mm.

Male

Head.—Frontal bristles six to nine, with several interstitials. Parafrontals silvery-pollinose, almost contiguous, increasing from 0.04 to 0.10 mm. Parafacials narrow. Postoccipital bristles fine, irregularly biserial. Third antennal segment broad (0.18 by 0.26 mm.).

Thorax.—Brownish-black, nonvittate. Acr. triserial presuturally, quadriserial postsuturally. All thoracic setulae long and fine, extending laterally over prealar area with no distinct prealar bristle. Stigmatal setulae about six. Mesopleurals numerous, a few anterodorsally strong. Scutellar disc bare basally and mesally. Squamae and haltere clear yellow. Wing membrane lightly infuscated, veins dark brown.

Abdomen.—1.4 by 2.2 mm. Grey-pollinose, the median vitta black, broadly triangulated, fading out laterally.

Legs.—Black, not even knees yellowish. C_1 with a weak but distinct preapical ventral thorn. F_1 pvs. in a full row, distinctly weaker on basal half.

T_1 with no median ad. C_2 with strong lateral bristles and a slightly stronger and apically hooked ventral bristle. F_2 avs. as long as femoral width basally, decreasing evenly apicad to five comblike bristles; pvs. with four long and strong on basal fourth, then a triple row of bristles as long as femoral width on median half, preapically with a comb of six short bristles. T_2 moderately thickened on apical three-fifths, the mat stronger and denser on the swollen portion. F_3 with two or three strong preapical avs., erect setulae basad; pvs. setulose to apex. T_3 with three to five short avs., about five short medial ads., and a few erect pv. setulae.

Female

Recognized most easily by its small size, rarely exceeding four mm. in length. Otherwise inseparable from others of the *manicata* complex.

Head.–Dark brownish-black-pollinose.

Thorax.–Dark brownish-black-pollinose, nonvittate. Acr. triserial presuturally, irregularly quadriserial postsuturally. Disc of scutellum largely bare.

Abdomen.–Subshining black, weakly and evenly subpollinose.

Legs.–F_2 avs. and pvs. setulose, except for a few weak suberect bristles on basal half. T_3 usually with three strong avs.; three to five erect ads. (usually only three strong).

Type locality and type

Treptow, Germany. Type in the Zoologische Museum, Berlin, Germany.

Remarks

The species is known in Europe from Germany (Treptow and Stolp) and Scotland (Pertshire and Bettyhill-Butherland). In this country it is almost equally rare and restricted to far northern localities, along treeline.

Records, 23 ♂♂, 11 ♀♀ (Map 4)

NORTHWEST TERRITORIES. Salmita Mines (64°05′, 115°15′), 8 ♂♂, 2 ♀♀; Muskox Lake (64°45′, 108°10′), 1 ♂, 2 ♀♀; Padley, 3 ♂♂, 1 ♀. ALBERTA. McMurray, 1 ♂. MANITOBA. Geillini Lake (60°18′, 45°35′), 5 ♂♂, 1 ♀; Mile 505, Hudson Bay Railway, 1 ♂. QUEBEC. Payne Bay, 1 ♂; Indian House, 2 ♂♂, 2 ♀♀. LABRADOR. Hebron, 1 ♂. YUKON. Rampart House, 3 ♀♀.

I have not as yet seen any European material of this species.

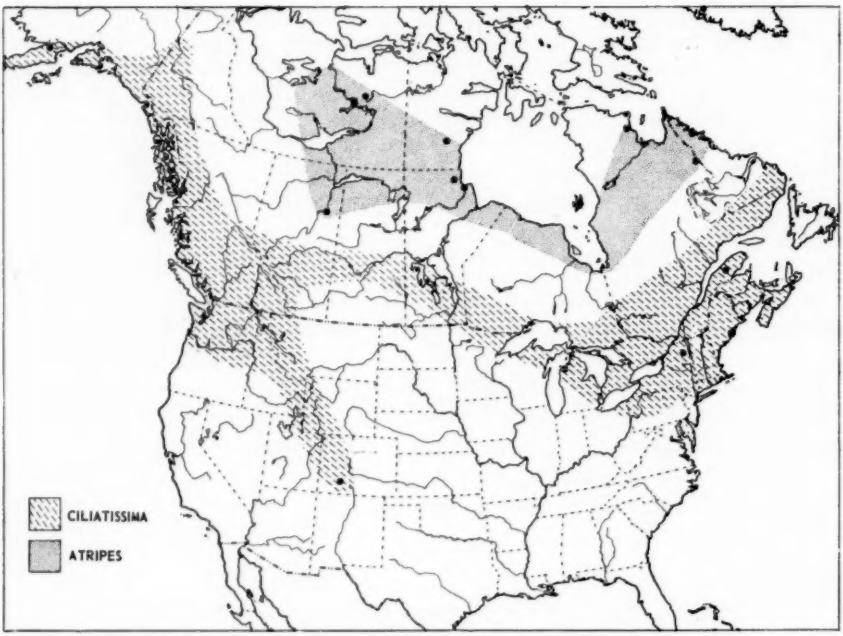
Fannia ciliatissima, new species

Figs. 6, 6A, 224

This species is very close to the Palaearctic *ciliata* Stein, but is separated on several minor characters. The thoracic setulae are longer and finer, the squamae clear yellowish (except in one Colorado specimen), the abdomen largely blue-pollinose, the hind-tibial bristles shorter and stronger, and the apical hind-tarsal segment with several long, curled hairs. The species can be recognized from other Nearctic forms by the simple mid legs and long (twice tibial diameter) hind-tibial bristles. Length 5.0-5.5 mm.

Male

Head.–Frontal bristles seven to 10, with a few interstitials. Parafrontals brownish-pollinose, almost contiguous, narrow (0.03 increasing to 0.07 mm.). Postoccipital bristles biserial, extending well toward verticals.



Map 4. Geographic distributions of *F. ciliatissima* Chill. and *F. atripes* Stein.

Thorax.—Dark brownish-black, nonvittate. Acr. triserial, the median row strong. Accessory setulae long and numerous, the intraalars extending over the prealar area, no distinct pra. Stigmatal setulae six to eight. Mesopleurals numerous, a few anterodorsally stronger. Scutellar disc bare mesally, sparsely setulose laterally. Squamae clear whitish-yellow, haltere yellow. Wing membrane weakly infuscated, veins dark brown.

Abdomen.—1.8 by 3.0 mm. Distinctly bluish-pollinose on the apical two-thirds, brownish basad and along the distinct triangulated median vitta.

Legs.—Black, not even the knees yellow. C_1 with the preapical ventral strong. F_1 pvs. weaker basad. T_1 with no median ad. C_2 apical bristle small, compressed, hooked apically. F_2 avs. with four or five basally weak, then five strong close-spaced and faintly hooked, a break, and an apical comb of four or five; pvs. with six to eight strong, 1.5 times as long as femoral diameter on basal half, then a trebled row of faintly hooked bristles extending almost to apex. T_2 faintly swollen at three-tenths, weakly constricted at six-tenths, then enlarged slightly to apex; median ad. strong, pd. weak. F_3 with six strong preapical avs., erect setulae basally; pvs. as erect setulae to apex, one stronger preapically. T_3 avs. numerous (about 15), twice tibial diameter; ads. equally long and numerous; pvs. with about six erect setulae at basal third. Last hind-tarsal segment with several long curled hairs extending well beyond tip (exclusive character).

Female

Not known.

Remarks

This species is only known from a few montane and coastal localities scattered from Alaska to Maine (Map 4). The specimens have been compared to three males of *ciliata* from Abisko, Sweden.

Type

Holotype.– ♂, Mt. Albert, Quebec, 28.VII.1954 (J. E. H. Martin). (C.N.C. No. 6646).

Paratypes.–5 ♂♂ as follows: 1 ♂, same data as type; 1 ♂, S.W. Harbor, Maine, 29.VII.1925; 1 ♂, Mt. Marcy (Heart Lake 2150 ft.), New York, 7.VII.1938 (C. P. Alexander); 1 ♂, Creede, Colorado, 6.VII.1937 (C. L. Johnston); 1 ♂, Brooks Lake, Alaska, 8.VII.1953 (W. C. F.).[5]

Fannia columbiana, new species

Figs. 9, 9A, 225

This species is obviously very closely related to *ciliata* and *ciliatissima*, but is easily separated from both by the unusual shape of the mid-coxal bristle and the presence of many dorsal bristles on the hind tibia. It has the dark squamae and halteres and dark pollinose abdomen typical of *ciliata*, but the more profuse thoracic bristling of *ciliatissima*. Length 5.5 mm.

Male

Head.–Frontal bristles seven to 10, with several strong interstitials. Parafrontals as described for *ciliatissima*. Postoccipital bristles uniserial, extending well toward verticals.

Thorax.–As described for *ciliatissima*, except: stigmatal setulae 2-4; squamae pale brown, the margins dark brown; haltere black.

Abdomen.–1.8 by 3.0 mm. Dark brownish-black-pollinose, the pollen dense and largely obscuring the median vitta.

Legs.–As described for *ciliatissima*, except as follows: C_2 bristle (Fig. 225) strong, rounded apically, with a preapical projection. F_3 with six to eight strong preapical avs., grading basad into erect setulae; pvs. as erect setulae to apex. T_3 avs. about 18, 1.5 times tibial diameter, dorsals about five strong with a few weaker interstitial bristles, pvs. with a few erect setulae above the middle. Apical hind-tarsal segment with several short curled hairs extending beyond the tip.

Female

Separable from others of the *manicata* complex by the three or four dorsal bristles on the hind tibia.

Remarks

This species is known from the single holotype specimen.

Type[6]

Holotype.– ♂, Yoho National Park, British Columbia, 22.VII.1955 (J. R. McGillis) (C.N.C. No. 6647).

[5]Four additional paratypes, as follows: 1♂, 32 mi. W. of Terrace, British Columbia, 9.VII.1960 (B. S. Heming); 2♂♂, Base of Mt. Thornhill (700 ft.), nr. Terrace, British Columbia, 30.VII.1960 (W. R. Richards); 1♂, Lakelse bog, nr. Terrace British Columbia, 1.VIII.1960 (C. H. Mann).

[6]Collections from the Terrace, British Columbia area have added the following material; the majority of specimens having been collected from flower heads of *Heracleum lanatum*.
Allotype.– ♀, 32 mi. W. of Terrace, British Columbia, 11.VI.1960 (J. G. Chillcott) (C.N.C.).
Paratypes.–7♂♂, 7♀♀, as follows: 32 mi. W. of Terrace: 1♂, 6.VI.1960 (J. G. Chillcott); 1♂, 1♀, 4.VI.1960 (G. E. Shewell), 1♂, 6.VI.1960 (G. E. Shewell); 1♀, 6.VI.1960 (C. H. Mann); 2♂♂, 8.VI.1960 (C. H. Mann). 2♂♂, Remo, nr. Terrace, 13.VI.1960 (J. G. Chillcott); 2♀♀, Terrace, 11.VI.1960 (C. H. Mann); 1♀, Lakelse bog, nr. Terrace, 8.VII.1960 (C. H. Mann); 2♀♀, Shames, 23.VI.1960 (C. H. Mann).

Fannia enotahensis Seago

Figs. 7, 7A, 226, 274

Fannia enotahensis Seago, 1954, p. 141.

This species is very close to *monilis* and *manicata;* it is separable mainly by the long (twice tibial diameter) anteroventrals and anterodorsal bristles on the hind tibia. Length 4.0-5.0 mm.

Male

Head.—Frontal bristles numerous, 10 to 12. Parafrontals usually brown-pollinose on the dorsal half, very narrow (0.02 increasing to 0.06 mm.) separated by a narrow (0.07 mm.) frontal vitta. Postoccipital bristles irregularly uniserial to verticals.

Thorax.—Dark brownish-black, nonvittate. Acr. evenly triserial. Accessory and intraalar setulae numerous, slender, no distinct pra. Stigmatals about four. Mesopleurals not stronger dorsad. Scutellar disc bare mesally, rather sparsely setulose laterally. Squamae dark brown, haltere yellowish-brown. Wing veins brown, membrane infuscated.

Abdomen.—Elongate (1.3 by 2.7 mm.). Dark brownish-pollinose, the pollen obscuring the median vitta, caudal segments more bluish-grey.

Legs.—Black, not even the knees yellow. C_1 with a distinct, moderately developed, preapical ventral thorn. F_1 pvs. slender, decreasing basad. T_1 yellowish on basal two-thirds, preapically with a short black patch of flattened hairs on anterior surface, with a large cluster of long, flat, black bristles on posterior surface; no median ad. C_2 apical bristle short, broad, and apically hooked. F_2 avs. with six as long as femoral width on basal half, then six shorter and apically hooked, a space, and a preapical comb of six; pvs. in a full row, twice femoral width basad, gradually decreasing apicad, trebled and shorter than femoral width on apical half. T_2 enlarged evenly on apical half, medially with one ad., two or three pds. F_3 avs. with two or three strong preapicals, short erect setulae basad; pvs. erect on basal half. T_3 avs. and ads. in full rows of bristles twice as long as tibial diameter, the anterior row shorter (as long as tibial diameter); pds. absent or as a few weak erect setulae.

Female

Inseparable from other females of the *manicata* complex (see *atripes*).

Larva (Fig. 274)

Laterodorsal processes with short, slender, bifurcate or weakly trifurcate projections on basal two-thirds of each (except those on thoracic segments, which are bare); lateroventral processes short but distinct, with short simple processes (processes of second thoracic segment inconspicuous, button-like); dorsal processes short, button-like; dorsolateral processes with three or four short simple projections. Posterior spiracular stalk shorter than basal diameter; spiracular processes radially arranged, fused together.

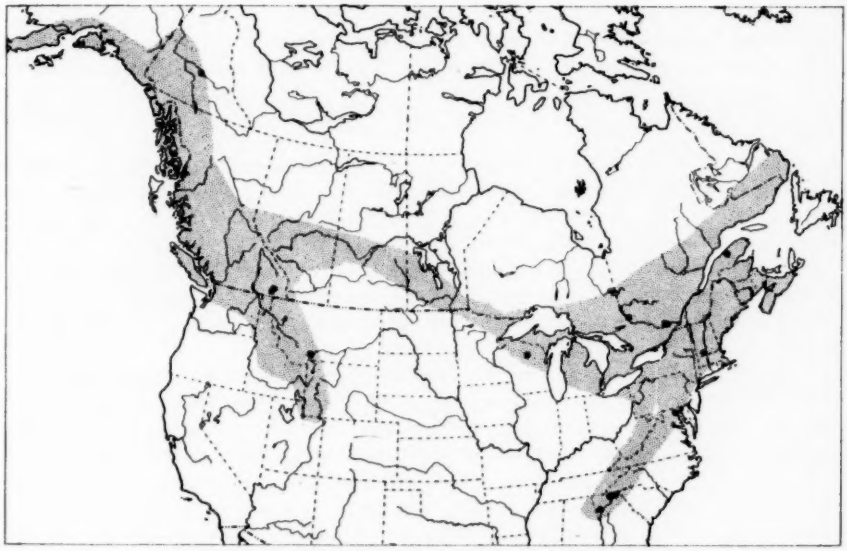
Description based on several associated puparia reared from decaying fungi, Beech Grove, Quebec.

Type and type locality

Mt. Enotah, Georgia. Type in the U.S. National Museum, No. 61793.

Remarks

From the description, *F. bifimbriata* Collin is inseparable from this species, but the distribution of *enotahensis* does not support the belief that the Greenland



Map 5. Geographic distribution of *F. enotabensis* Seago.

form could be the same species. However, until the types can be compared, the status of the two species remains in doubt.

Records, 57 ♂♂, 91 ♀♀ (Map 5)

YUKON. Haggard Creek, 1 ♂. BRITISH COLUMBIA. Robson, 1 ♂; Cranbrook, 1 ♂. MONTANA. Bozeman (Mont. Exp. Sta.), 1 ♂. WISCONSIN. Razorback Lake (fly trap), 2 ♂♂ paratypes, 2 ♀♀. QUEBEC. Laniel, 2 ♂♂, 1 ♀; Beech Grove (ex decaying fungi), 3 ♂♂, 3 ♀♀; Alymer, 1 ♂; Mt. Albert, 2 ♂♂. MARYLAND. Baltimore, 3 ♀♀. VERMONT. Jacksonville (fly trap), 2 ♂♂ paratypes. GEORGIA. Mt. Enotah (Brasstown Bald), Towns-Union Co. (ex carrion-baited fly trap), 25 ♂♂, 26 ♀♀ (type series), 29 ♀♀; Rabun Bald (fly trap), 6 ♂♂, 10 ♀♀ (paratypes), 16 ♀♀; Kennesaw Mt., Cobb Co., 1 ♀.

Collecting dates from June 9 to October 23.

Fannia manicata (Meigen)

Figs. 8, 8A, 157, 228, 275

Anthomyia manicata Meigen, 1826, p. 140; Macquart, 1835, p. 333; Dufour, 1840, p. 152.

Aricia manicata, Zetterstedt, 1845, p. 1576.

Homalomyia manicata, Schiner, 1862, p. 655; Hagen, 1881, p. 50; Meade, 1882, p. 203; Lampa, 1887; Strobl, 1893, p. 237; Stein, 1895, p. 39; Meade, 1897, p. 62; Pandellé, 1899, p. 185; Aldrich, 1905, p. 538; Wingate, 1906, p. 279.

Fannia manicata, Stein, 1907a, p. 661; Schnabl, 1911, p. 89; Schnabl and Dziedzicki, 1911, Figs. 365, 366, 838; Malloch, 1912a, p. 159; Stein, 1913, p. 26; Stein, 1916, p. 81; Graham-Smith, 1916, p. 440; Kramer, 1917, p. 40; Riedel, 1919, p. 166; Séguy, 1923, p. 271, Figs. 534-6, 544; Karl, 1928, p. 57, Fig. 43; Ringdahl, 1928, p. 25; Riedel, 1930, p. 79; Ringdahl, 1934a, p. 113; Tiensuu, 1935, p. 45; Tiensuu, 1936, p. 165; Séguy, 1937, p. 161-2; Wright, 1940, p. 55; Ringdahl, 1944a, p. 17; James, 1947, p. 128; Hennig, 1950, p. 84-5; Zangheri, 1950, p. 88; Ringdahl, 1951, p. 166; Parmenter, 1951, p. 250; Ringdahl, 1953, p. 156, Figs. 9, 14; Ringdahl, 1954a, p. 71 (Fig.); Hennig, 1955, p. 60, Fig. 17; Gill, 1955, p. 652.

Anthomyia armillata Zetterstedt, 1838, p. 679; syn. *teste* Zetterstedt, 1845, p. 1577 and Ringdahl, 1939, p. 140.

Anthomyia acra Walker, 1849, p. 951; syn. *teste* Stein, 1901, p. 185 and Huckett, 1934, p. 133.

Anthomyia uxama Walker, 1849, p. 948; syn. *teste* Huckett, 1934, p. 140.

This species may be separated from related species by the strongly swollen mid tibiae, and the numerous hind-tibial posteroventrals. This species has the most elaborate form of any species of the *scalaris* subgroup. Length normally 5.0-6.5 mm., rarely as small as 4.2 mm.

Male

Head.—Frontal bristles nine to 11, with rather strong interstitials. Parafrontals silvery-pollinose, brownish-pollinose only near the ocellar triangle, increasing from 0.03 to 0.12 mm., separated by a frontal vitta 0.06 mm. wide. Postoccipital bristles irregularly biserial.

Thorax.—As described for *enotahensis* but scutellar disc setulose except basally; squamae whitish, the margins deep yellowish; haltere yellow.

Abdomen.—Almost twice as long as broad. Grey-pollinose, brownish-pollinose basad, the median vitta distinct and triangulated.

Legs.—Black, not even the knees yellowish. Front legs as described for *enotahensis*. C_2 with a long, compressed, only faintly hooked apical bristle. F_2 avs. with six wide-spaced on basal half shorter than femoral diameter, then four or five close-set and stronger, followed by five or six short, a long space, and a minute preapical comb; pvs. with a simple row of fine bristles as long as femoral diameter on basal half, then suddenly stronger and trebled to apical sixth. T_2 even on basal half, then rapidly swelling to twice basal diameter, and narrowing slightly on apical fourth; mat strong on apical half. F_3 with two strong preapical avs., evenly decreasing basad; pvs. with erect setulae on apical half. T_3 with avs. and ads. about 1.3 times tibial diameter; anterior row of prostrate setulae only; pvs. with about 12 on apical two-thirds, as long as tibial diameter.

Female

Inseparable from other members of the *manicata* complex (see *atripes*).

Larva (Fig. 275)

As described for *enotahensis*, but the spiracular stalk very short, scarcely raised above integumental surface, and the stalks connected by a rounded, curved ridge of integument.

Description based on an associated puparium from Plummer's Island, Maryland, and on published descriptions and figures.

Type locality and type

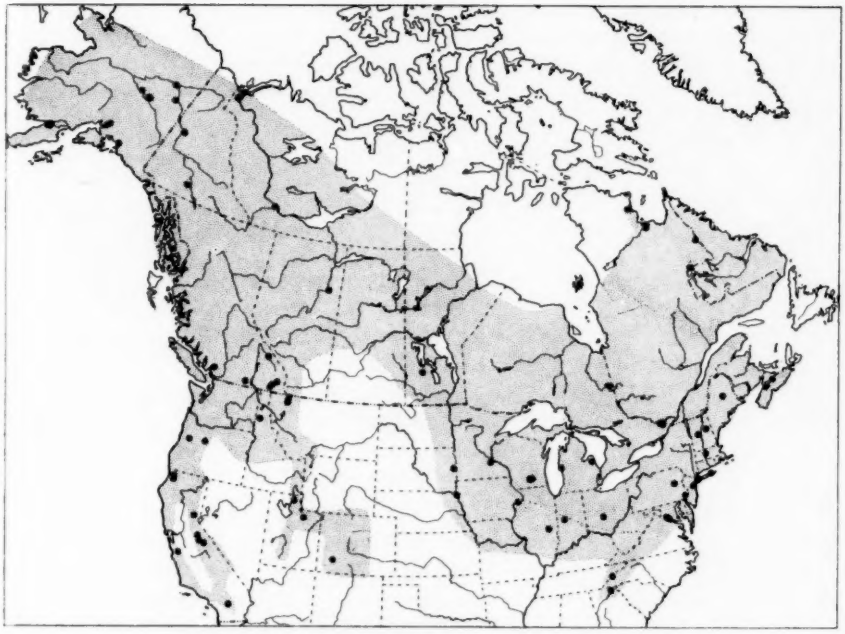
Not given in original description of *manicata;* restricted to Aachen, Germany. Type of *manicata* in Muséum National d'Histoire Naturelle, Paris.

Type localities of *acra* and *uxama*: St. Martin's Falls, Ontario. Types in the British Museum.

Remarks

The larvae are known from a variety of habitats. The species has been reared from fungi: *Boletus tomentosus* (Stein, 1923) and *Polyporus sulphureus* (Bull.) Fr. (Stein, 1895); from birds' nests: *Pernis apivorus* L. (Palm, 1936), *Delichon urbica* L., and *Hirundo rustica* L. (Séguy, 1946); from wasps' nests: *Vespa crabo* L. (Séguy, 1923) and other Hymenoptera (Séguy, 1937); and from decaying vegetation (James, 1947). It has been implicated in cases of intestinal myiasis (Lampa, 1887; James, 1947). The adults are attracted to honey dew (Tiensuu, 1936), to carcasses (Hennig, 1950), and to traps baited with beef liver, carrion, and excrement (Gill, 1955).

Specimens before me have been reared from piled onions.



Map 6. Geographic distribution of *F. manicata* (Meig.).

The species is known in the Palaearctic region from the north coast of Scandinavia and Scotland south to Italy and Corsica, Croatia and Egypt; east to Kamtchatka. Known in North America from near treeline to the southern limits of the boreal zone across the entire continent.

Records, 140 ♂♂, 206 ♀♀ (Map 6)

ALASKA. Matanuska, 43 ♂♂, 23 ♀♀, 1 ♂ (ex decaying vegetation); Matanuska Valley, near Palmer, 1 ♂; Fairbanks, 1 ♂, 18 ♀♀; Brooks Lake, 1 ♀; Valdez, 2 ♂♂; Camp 297, Alsk. Eng. Comm., 1 ♀; Camp 327, Alsk. Eng. Comm., 1 ♀; King Salmon, Naknek R., 1 ♀; Anchorage, 2 ♀♀; On tundra, Naknek, 1 ♂, 3 ♀♀; Ladd A. F. B., 16 ♀♀; Circle, 4 ♀♀; Mile 300, Richardson Hwy., 7 ♀♀; Ft. Yukon, 2 ♀♀. NORTHWEST TERRITORIES. Reindeer Depot, 4 ♂♂, 3 ♀♀; Aklavik, 1 ♂, 2 ♀♀; Fort Simpson, 1 ♂. YUKON. Whitehorse, 1 ♀; King Solomon's Dome (4040 ft.), 1 ♂. BRITISH COLUMBIA. Robson, 2 ♂♂; Cranbrook, 1 ♂; Squamish, 3 ♀♀; Carbonate, Columbia R., 1 ♀; Keremeos, 2 ♀♀; St. Mary's, 1 ♀; Massett, Graham I., 1 ♀. WASHINGTON. Seattle, 1 ♂; Copalis, 1 ♀; Ocean Park, 1 ♀. IDAHO. Coeur d'Alène, 1 ♀. OREGON. Corvallis, 1 ♂; Mt. Jefferson (3000 ft.), 1 ♀. MONTANA. Bozeman, 1 ♀; Lake McDonald, 2 ♀♀; Glacier Park, 2 ♀♀. UTAH. Beaver Creek, Logan Canyon, 1 ♀; Hole in Rock Canyon, Uinta Mts., 1 ♀. COLORADO. Lake City (8700 ft.), 1 ♀. CALIFORNIA. Yosemite National Pk., 1 ♀; Scott Mt. (5358 ft.), 1 ♂; Idyllwild, San Jacinto Mts., 1 ♂; Trinity Co., 1 ♀; Yosemite (3900 ft.), 1 ♀; Bumble Bee, Tuolomne Co., 5 ♀♀; Morgan Hill, 1 ♀; Gold Lake, Sierra Co., 1 ♀. MANITOBA. Dauphin Lake, 7 ♂♂, 1 ♀. SOUTH DAKOTA. Brookings, 1 ♂. MINNESOTA. Hennepin Co., 1 ♂. WISCONSIN. Madison, 1 ♂; Dane Co., 1 ♂. IOWA. Davenport (ex onion pile), 3 ♀♀; Sioux

City, 1 ♀. MICHIGAN. Huron Co., 1 ♀; Muskegon (ex fly trap), 3 ♀♀. OHIO. Ohio Expt. Station (ex onions), 1 ♂, 2 ♀♀. ILLINOIS. Urbana, 1 ♀. INDIANA. Lafayette (at bait), 1 ♂. ONTARIO. Ottawa, 1 ♂; Bell's Corners, 1 ♀; Manotick, 1 ♀. QUEBEC. Fort Chimo, 2 ♂♂; Knob Lake, 6 ♂♂, 3 ♀♀; Indian House, 14 ♂♂, 10 ♀♀. NOVA SCOTIA. Kentville, 1 ♀; Truro, 1 ♀. NEW HAMPSHIRE. White Mts., 1 ♂. MAINE. Mt. Katahdin (4800 ft.), 1 ♀. MASSACHUSETTS. Amherst, 1 ♀. VERMONT. Mt. Ascutney, 1 ♀. NEW YORK. Orient, L. I., 1 ♂; Huntingdon, L. I., 1 ♂; Uphill Brook (3200 ft.), 1 ♀. NEW JERSEY. New Brunswick, 9 ♂♂, 6 ♀♀. PENNSYLVANIA. Spring Brook (D. D. T. Expt.), 18 ♂♂, 5 ♀♀; Hazelton, 1 ♂. VIRGINIA. Dead Run, Fairfax Co., 1 ♂, 2 ♀♀. MARYLAND. Plummer's Island, 2 ♂♂, 1 ♀ with puparia), 2 ♂♂, 2 ♀♀. TENNESSEE. Gatlinsburg (3500 ft.), 1 ♀, (4000 ft.), 1 ♀. GEORGIA. Rabun Bald and Co., 5 ♂♂.

Collecting dates from April 8 to October 18.

I have also seen 5 ♀♀ from Sondrestrom Air Base, Greenland; and 29 specimens from England, Sweden, and Germany.

fuscula subgroup
Fannia fuscula (Fallén)

Figs. 11, 158, 230

Musca fuscula Fallén, 1825, p. 86.
Anthomyza fuscula, Zetterstedt, 1845, p. 1686; Zetterstedt, 1849, p. 3310.
Homalomyia fuscula, Meade, 1882, p. 202; Meade, 1887, p. 252; Strobl, 1893, p. 238; Stein, 1895, p. 25; Meade, 1897, p. 61; Stein, 1897, p. 171; Pandellé, 1899, p. 185; Aldrich, 1905, p. 538; Wingate, 1906, p. 278.
Fannia fuscula, Stein, 1907a, p. 659; Malloch, 1912a, p. 156; Stein, 1913, p. 24; Stein, 1916, p. 81; Kramer, 1917, p. 40; Séguy, 1923, p. 270, Figs. 511-514; Karl, 1928, p. 52, Fig. 42, Audcent, 1932, p. 365; Ringdahl, 1934a, p. 112; de Vos-de Wilde, 1935, p. 78-80, Figs. 68-72; Tiensuu, 1935, p. 45; Timon-David, 1937, p. 13; Aczél, 1940, p. 33; Ringdahl, 1944a, p. 17; Ringdahl, 1951, p. 167; Ringdahl, 1952, p. 156; Ringdahl, 1954a, p. 70; Hennig, 1955, p. 43; Gill, 1955, p. 652.
Anthomyia floricola Meigen, 1826, p. 145; syn. *teste* Stein, 1900, p. 153.
Homalomyia floricola, Schiner, 1862, p. 656; Meade, 1882, p. 205.
Homalomyia cilicrura Rondani, 1866, p. 128; Rondani, 1877, p. 56; syn. *teste* Stein, 1895.
Homalomyia tetracantha Loew, 1872, p. 69; syn. *teste* Stein, 1897.
Homalomyia obesa Loew, 1873, p. 47; syn. *teste* Stein, 1895.
Homalomyia fuscata (sic), Schnabl, 1911, p. 89.

This species is typical of the *fuscula* subgroup, which has strong sternopleural and mid-coxal spines. It may be separated from all but the very closely related *americana* by the broad male frontal vitta and linear abdominal vitta; and from *americana* by the much shorter hind-tibial bristles (at most 1.5 times tibial diameter). Length 5.5-7.0 mm.

Male

Head.—Frontal bristles six to 10, with a few interstitials. Parafrontals mainly silvery-pollinose, dorsally brownish-pollinose, increasing in width from 0.05 to 0.12 mm., separated by a frontal vitta which is at least 0.12 mm. broad. Postoccipital bristles absent.

Thorax.—Dark brown, weakly grey-pollinose, nonvittate. Acr. triserial presuturally, irregularly quadriserial postsuturally. Accessory setulae short, rather sparse, the intraalars uniserial with two or three isolated setulae on prealar area. Stigmatal setulae none or one. Mesopleurals moderate in number, the full dorsal row distinctly stronger. Sternopleuron with a strong, flattened, blunt,

ventral thorn. Scutellum bare medially and basally. Squamae and haltere yellow. Wing veins brown, membrane faintly infuscated.

Abdomen.—1.8 by 2.8 mm. Bluish-grey-pollinose, the median vitta linear, fading out caudad. Hypopygium moderately projecting.

Legs.—Femora dark reddish-brown, tibiae reddish-yellow, tarsi black. C_1 with no strong ventral bristle. F_1 pvs. weak on basal third. T_1 with no median ad. C_2 apical bristle only slightly flattened, weakly hooked. F_2 avs. moderately strong, about nine on basal half (at most half femoral diameter), evenly decreasing to a fine comb of about 12; pvs. about five widespread on basal half (two-thirds femoral diameter), then shorter and duplicated, grading into a preapical comb. T_2 increasing evenly on apical half to 1.5 times basal diameter; mat very fine on basal portion, stronger and denser apically. F_3 avs. strong, half femoral diameter basad, the preapical three or four strong; pvs. and ventrals setulose, irregular, slightly stronger preapically. F_3 on posterior surface with only three or four strong bristles on basal third. T_3 avs. strong, 1.5 times tibial diameter, in a full row; ads. about six, the strongest apicad; pvs. finer than avs. but equally long; ventrals shorter and finer.

Female

Head.—Distance between the eyes one-fourth of total head width, the parafrontals parallel-sided, one-fourth as broad as long, setulae in one (often reduced) row. Frontal vitta narrow. Postoccipital bristles absent.

Thorax.—Acr. triserial, weakly quadriserial caudad, the median row weak. Pra. bristles weak, setulose. Stigmatal setulae absent.

Abdomen.—Grey-pollinose, the median vitta faint or absent.

Legs.—Femora black to reddish, tibiae yellow. F_2 avs. and pvs. setulose, basally somewhat stronger. T_3 avs. and ads. four to six on median third.

Larva

Not known to me. The figures given by de Vos-de Wilde (1935) appear to be more likely attributable to *canicularis* than to any member of this species group.

Type and type locality

Esperod, Skäne, Sweden. Location of type of *fuscula* unknown.

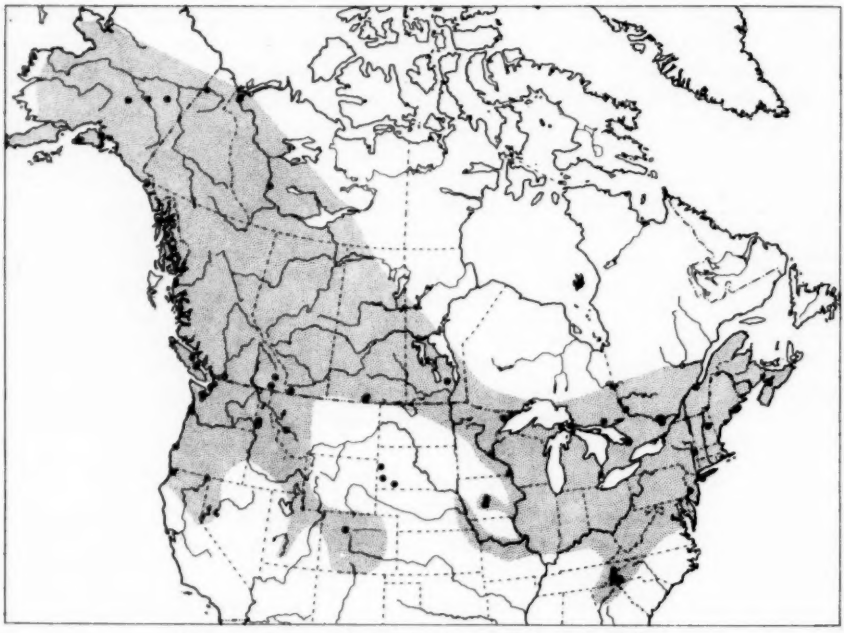
Type locality of *tetracantha* given as "Middle States". Type apparently lost.

The species has been collected from the nests of wasps and bumble-bees (Séguy, 1923; de Vos-de Wilde, 1935). Adults are attracted to baits of beef liver and excrement (Gill, 1955). A specimen before me has been reared from a mushroom.

The species is known in Europe from southern Scandinavia and Scotland south to Yugoslavia and Corsica. Known in North America from A'aska to California, east through Manitoba and Iowa to Nova Scotia and Tennessee.

Records, 74 ♂♂, 56 ♀♀ (Map 7)

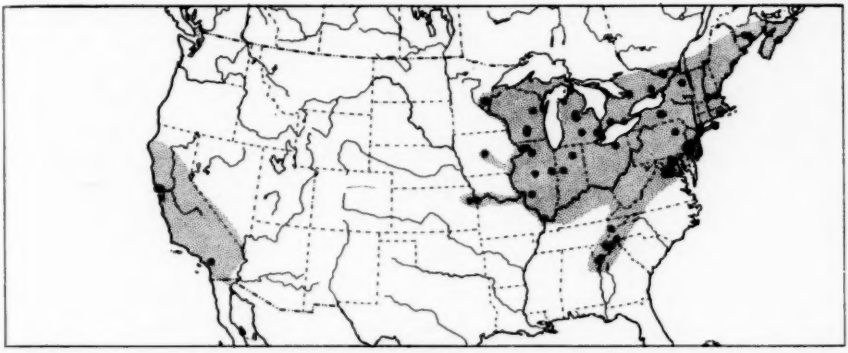
ALASKA. Ladd A. F. B., 1 ♂, 2 ♀♀; Anchorage, 1 ♀ (ex mushroom); Minchumina, 1 ♂, 1 ♀; Central, 1 ♀ (Gill, 1955), 1 ♂. YUKON. Rampart House, 6 ♂♂, 2 ♀♀. NORTHWEST TERRITORIES. Aklavik, 1 ♂, 1 ♀; Fort Wrigley, 1 ♂. BRITISH COLUMBIA. Bowser, 2 ♂♂, 2 ♀♀; Robson, 3 ♂♂, 1 ♀; Miracle Beach, nr. Oyster R., 3 ♀♀; Cultus Lake, 3 ♂♂; Kaslo, 1 ♂, 1 ♀;



Map 7. Geographic distribution of *F. fuscula* (Fall.).

Prince Rupert, 1 ♀; Mission City, 1 ♂; Butchart, Vancouver I., 1 ♂; Port Renfrew, 1 ♂; Carbonate, Columbia R., 1 ♂. ALBERTA. Waterton, 1 ♂; Lethbridge, 1 ♂; Onefour, 1 ♀. WASHINGTON. Ilwaco, 1 ♂; Birch Bay, 1 ♂; Seaview, 1 ♀; Dartford, 1 ♂; Dewatto, 1 ♂. MONTANA. Missoula, 1 ♂. OREGON. Bandon, 1 ♀; Boiler Bay, 1 ♂, 1 ♀. IDAHO. Gold Hill, Latah Co., 1 ♂, 2 ♀♀; Avon, 1 ♂; Moscow, 1 ♂; Potlatch, 1 ♂; Lake Waha, 1 ♀. COLORADO. Aspen (39°11′, 106°49′) (8000 ft.), 1 ♂. CALIFORNIA. Lagunitas Canyon, Marin Co., 1 ♂; Smith River, 1 ♀. SASKATCHEWAN. Rockglen (49°11′, 105°56′), 1 ♂, 2 ♀♀; St. Victor (49°20′, 105°54′), 2 ♂♂. MANITOBA. Teulon, 1 ♀. SOUTH DAKOTA. Interior, 1 ♂; Custer, 1 ♀; Spearfish, 1 ♂, 1 ♀. MINNESOTA. Basswood Lake, Lake Co., 1 ♂, 1 ♀; Cook Co., 1 ♂; Grand Marais, 1 ♀; Mouth Snake River, Pine Co., 1 ♀; Mississippi Bluff, Houston Co., 1 ♀. IOWA. 4 mi. east of Gilbert, 1 ♀; Ledges State Park, Boone Co., 1 ♀. MICHIGAN. Luce Co., 1 ♂. ONTARIO. Sault Ste. Marie, 1 ♀; Sudbury Co., 1 ♂; Niagara Glen, 2 ♀♀; Ottawa, 5 ♂♂, 1 ♀; Orillia, 1 ♂. QUEBEC. Aylmer, 1 ♂; Meach Lake, 3 ♂♂; Laniel, 1 ♂, 4 ♀♀; Lauzon, 1 ♂; Hull, 1 ♀. NOVA SCOTIA. Kentville, 1 ♀. MAINE. Bar Harbour, 1 ♂; Echo Lake, Mt. Desert, 2 ♂♂. MASSACHUSETTS. New Bedford, 1 ♂. NEW HAMPSHIRE. Noxen Camp (2000 ft.), 1 ♂. NEW YORK. Babylon, L. I., 2 ♂♂; Troy, 1 ♀; Whiteface Mt., Adirondacks, 1 ♂, 2 ♀♀; Adirondack Lodge, 1 ♂. PENNSYLVANIA. Spring Brook (D. D. T. Expt.), 1 ♂. TENNESSEE. Elkmont (G.S.M.N.P.), 1 ♂; Gatlinburg (G.S.M.N.P.), 3 ♀♀. NORTH CAROLINA. Highlands (3100 ft.), 4 ♂♂, (3800 ft.), 2 ♀♀; Wayah Gap (5800 ft.), Macon Co., 1 ♂, 2 ♀♀; Pisgah Nat. Forest, Haywood Co. (5900 ft.), 2 ♀♀.

Collecting dates from May 26 to August 17, with the majority in mid-June. I have also examined 12 specimens from Germany, Austria, and England.



Map 8. Geographic distribution of *F. americana* Mall.

Fannia americana Malloch

Figs. 12, 159, 229

Fannia americana Malloch, 1927a, p. 176.

This is a strictly Nearctic equivalent of the Holarctic *fuscula*, and is distinguished by the male genitalia and longer hind-tibial bristles and a few other minor differences as follows:

Thorax.—Mesopleurals sparser.

Abdomen.—Pollen usually more bluish-green with the vitta more linear, less distinct.

Legs.—Femora usually more reddish. F_3 posterior surface with about six strong bristles, almost as long as femoral diameter, on second fourth of femur. T_3 avs. and pvs. long, somewhat stronger (twice tibial diameter); ads. usually more numerous (up to 10).

Female

Almost indistinguishable from *fuscula* externally, usually with more reddish legs. Ovipositor without the sclerotized eighth sternum of *fuscula* (Figs. 158-159).

Type locality and type

Pimmit Run, Virginia. Type in United States National Museum.

Remarks

The species ranges from Minnesota and Quebec to Georgia, with a few records from California.

Records, 172 ♂♂, 155 ♀♀ (Map 8)

CALIFORNIA. Redwood Canyon, Marin Co., 1 ♂; Glen Ivy, Riverside Co., 1 ♂. MINNESOTA. Ramsey Co., 2 ♂♂; Deep Haven (in fly trap), 1 ♀. WISCONSIN. Racine, 1 ♂; Clintonville, 2 ♀♀; Dane Co., 7 ♂♂, 4 ♀♀; Madison, 5 ♂♂, 1 ♀. MICHIGAN. Cheboygan Co., 1 ♂; Mason Co., 1 ♂; Kalkaska Co., 1 ♂; Midland Co., 1 ♂, 2 ♀♀; Clare Co., 1 ♀; Gull Lake, 1 ♀; Detroit, 1 ♂. ONTARIO. Ottawa, 2 ♂♂, 1 ♀; Marmora, 2 ♂♂, 1 ♀; Simcoe, 1 ♂; Pt. Pelee, 2 ♂♂; Orillia, 1 ♀; St. Thomas, 1 ♀; Bobcaygeon, 1 ♂. QUEBEC. Montreal, 1 ♀; Ile de Montréal, 1 ♂; Aylmer, 3 ♂♂. NOVA SCOTIA. Smith's Cove, 1 ♀. NEW BRUNSWICK. Fredericton, 1 ♂; St. John's, 1 ♂. NEW HAMPSHIRE. Hampton, 1 ♂; Jaffrey, 1 ♀. IOWA. Ames, 1 ♂, 1 ♀. KANSAS. Lawrence,

1 ♂. MISSOURI. Atherton, 1 ♂. ILLINOIS. Bloomington, 1 ♂; Dongola, 1 ♂; Savanna, 1 ♂, 2 ♀♀; Oregon, 1 ♂, 2 ♀♀; Dubois, 1 ♂; Muncie, 1 ♂; Freeport, 1 ♂, 1 ♀. INDIANA. Lafayette, 13 ♂♂, 5 ♀♀; Warsaw, 1 ♂, 3 ♀♀. OHIO. Summit Co., 1 ♂. PENNSYLVANIA. Spring Brook (D. D. T. Expt.), 2 ♂♂, 2 ♀♀; Castle Rock, 1 ♂, 2 ♀♀; Swarthmore, 6 ♂♂, 3 ♀♀; Roxborough, 2 ♂♂, 1 ♀; Glenside, 1 ♂; Pittston, 2 ♂♂; Philadelphia, 2 ♂♂; Montgomery Co., 2 ♂♂. NEW JERSEY. Trenton, 2 ♂♂, 1 ♀; Princeton, 1 ♂; Clementon, 2 ♂♂; Stone Harbour, 1 ♂; Woodbury, 1 ♂; Riverton, 1 ♂, 2 ♀♀. NEW YORK. Ithaca, 6 ♂♂, 2 ♀♀; Buttermilk, Ithaca, 1 ♀; Ringwood, Tomkins Co., 2 ♂♂; Coy Glen, near Ithaca, 1 ♂; Cold Spring Harbor, L. I., 1 ♂, 2 ♀♀; Babylon, L. I., 2 ♂♂; Syosset, L. I., 2 ♀♀; Lakeville, L. I., 3 ♂♂, 5 ♀♀; Greenport, L. I., 1 ♂; Yaphank, L. I., 1 ♀; Riverhead, L. I., 1 ♂, 2 ♀♀; Plandome, L. I., 1 ♂; Little Neck, 1 ♀; Valley Stream, 2 ♂♂, 1 ♀; Bog A, McLean Res., 1 ♀; Freeville, 1 ♀; Staten I., 1 ♀; Glen Head, L. I., 2 ♂♂, 1 ♀. RHODE ISLAND. Wickford, 1 ♂. DISTRICT OF COLUMBIA. Washington, 6 ♂♂, 1 ♀; Rock Creek Park, 1 ♀. MARYLAND. Cabin John, 1 ♂, 1 ♀; Baltimore, 33 ♂♂, 20 ♀♀; Gunpowder R., Baltimore Co., 2 ♀♀; Plummer's I., 1 ♂, 2 ♀♀; Bowie, 2 ♂♂; Glen Echo, 1 ♂. VIRGINIA. Dead Run, Fairfax Co., 1 ♂; Chain Bridge, 1 ♂, 1 ♀; Acquia Creek, 1 ♀; Falls Church, 3 ♂♂, 2 ♀♀; Glencarlyn, 1 ♂; Pimmit Run, 1 ♂ (holotype), 2 ♂♂, 3 ♀♀. TENNESSEE. Knoxville, 1 ♀; Greenbriar Cove (2000 ft.) (G. S. M. N. P.), 1 ♂. NORTH CAROLINA. Macon Co., 6 ♀♀; Highlands (3800 ft.), 1 ♂. GEORGIA. Blue Mt., Towns and White Co., 5 ♀♀; Kennesaw Mt., Cobb Co., 7 ♀♀; Mt. Enotah, Towns-Union Co., 17 ♀♀; Rabun Co., 2 ♂♂, 19 ♀♀; Dekalb Co., 2 ♀♀. SOUTH CAROLINA. Newry, Oconee Co., 1 ♀.

Collecting dates from April 27 to September 3, with the majority in mid-June.

Fannia pellucida (Stein)

Figs. 10, 10A, 161, 231

Homalomyia pellucida Stein, 1897, p. 283.
Fannia pellucida, Séguy, 1937, p. 172.

This species has the characteristics of the *fuscula* subgroup, but can be separated from its relatives by the very strong hooked mid-coxal spine, and the extensively yellow abdomen. Its closest relatives are *insignis* and *presignis*, which share the heavy coxal spine and the *scalaris*-type genitalia. Length 5.5-7.0 mm.

Male

Head.—Frontal bristles strong, 12 to 14, few interstitials. Parafrontals usually silvery (brownish dorsally in cotypes), narrow (0.04 mm. increasing to 0.10 mm., except in Georgia specimens which vary from 0.03 to 0.06 mm.), contiguous. Postoccipital bristles absent.

Thorax.—Dark brown, lightly dusted with grey pollen, nonvittate. Acr. usually triserial presuturally (biserial in cotypes), quadriserial postsuturally. Accessory setulae usually numerous, long and fine (sparse and short in cotypes), extending beyond intraalars to reach the well-differentiated pra. Stigmatal setulae usually two. Mesopleurals numerous, dorsal row slightly stronger. Sternopleural thorn present, strong. Scutellum bare medially and basally. Squamae and haltere yellow. Wing veins brown, membrane faintly infuscated.

Abdomen.—Variable from 2.4 by 3.9, to 2.0 by 3.0 mm.; color variable. Eastern specimens have strongly yellowish color, the weakly triangulated vitta and part of last two segments dark blackish; western specimens are much darker, with

brownish pollen obscuring yellow integumental color, the broadly triangulated vitta and usually all of last two segments black.

Legs.—Variable in color (variation not geographic). All tibiae reddish, femora black to entirely reddish. C_1 with no ventral spine. F_1 pvs. strong throughout, shorter basad. T_1 with no median ad. C_2 apical bristle strong, compressed, hooked. F_2 avs. with about nine short, strong on basal half (two-thirds femoral width at one-third from base), a break, and a preapical fine comb of 12; pvs. with about five widespaced on basal half, followed by a doubled or trebled row, and a preapical comb. T_2 enlarged on apical half to 1.5 times basal diameter; mat very fine basad, stronger and denser apicad. F_3 avs. strong, half femoral diameter basally, with three or four preapically strong; pvs. setulose, irregular, somewhat longer preapically. T_3 avs. about nine, increasing apicad to 1.5 times tibial diameter; ads. about 10 shorter in a complete row; pvs. and ventrals fine, almost as long as tibial diameter.

Female

Head.—Parafrontals and frontal vitta narrowed, the distance between the eyes one-fourth of head width, parafrontals one-fourth as wide as long. Postoccipital bristles absent.

Thorax.—Acr. as in male, the median bristles strong. Stigmatal setulae absent.

Abdomen.—Yellow to reddish, the median vitta black, fairly distinct to barely visible.

Legs.—F_1 pvs. in a full row. F_2 avs. and pvs. setulose, basally somewhat stronger. T_3 with full rows of avs. and ads.

Type locality and type

Georgia. Type in Deutsches Entomologisches Institut, Berlin, Germany. I have examined two male cotypes collected in Tifton, Georgia, October, 1896, by G. N. Hough, now in the Chicago Natural History Museum.

Remarks

The species is known from New York to Georgia and west through the southern states to California.

Records, 12 ♂♂, 72 ♀♀ (Map 9)

GEORGIA. Tifton, 2 ♂♂ (cotypes); Mt. Enotah, Towns-Union Co., 2 ♂♂, 35 ♀♀; Rabun Bald and Co., 16 ♀♀; Dekalb Co., 7 ♀♀; Kennesaw Mt., Cobb Co., 6 ♀♀. NORTH CAROLINA. Mt. Mitchell (6800 ft.), 1 ♀. VIRGINIA. Woolwine, 2 ♂♂. MARYLAND. Baltimore, 3 ♀♀. NEW YORK. Troy (U.S. PHS trap), 2 ♀♀; Cold Spring Harbor, L. I., 1 ♀. PENNSYLVANIA. Lehigh Gap Pass, 1 ♂, 1 ♀; Philadelphia, 2 ♂♂. ARIZONA. Flagstaff, 1 ♂; Bear Wallow, St. Catalina Mts. (800 ft.) (32°25.3′, 110°44′), 1 ♀. NEW MEXICO. Magdalena Mts., 3 ♂♂. CALIFORNIA. Bumble Bee, Tuolomne Co., 3 ♀♀; Big Bear L. (7000 ft.), 2 ♀♀; Forest Home, San Bernardino Co., 1 ♀.

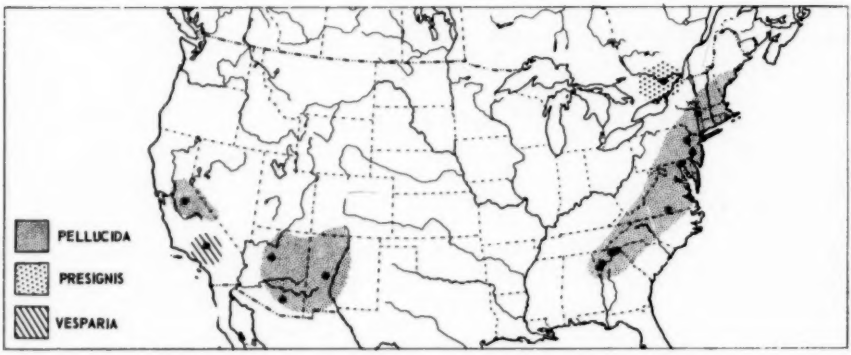
Collecting dates from July 8 to October 24.

Fannia vesparia (Meade)

Homalomyia vesparia Meade, 1891, p. 42.

Fannia vesparia, Kloet and Hincks, 1945, p. 421; Ringdahl, 1954a, p. 70; Hennig, 1955, p. 92, Fig. 21.

Homalomyia insignis Stein, 1895, p. 23; Wingate, 1905, p. 278; syn. *teste* Kloet and Hincks, 1945.



Map 9. Geographic distribution of *F. pellucida* complex.

Fannia insignis, Stein, 1907a, p. 661; Ringdahl, 1914, p. 146; Stein, 1916, p. 81; Kramer, 1917, p. 39; Karl, 1928, p. 51; Ringdahl, 1934a, p. 112; Tiensuu, 1935, p. 45; Karl, 1937, p. 128; Ringdahl, 1952, p. 156.
Fannia insignis var. *fumigerana* Tiensuu 1938, p. 31.

This species is very close to the Nearctic *pellucida*, recognized mainly by its dark coloration: the inner margin of the parafrontals are darkened, outer margin dull silvery-white; thorax blackish-brown, not greyish-pollinose; abdomen blue-grey-pollinose, the vitta rather linear; wings strongly brownish; legs black, with the fore tibiae and knees reddish. In addition the hind-femoral pvs. very short, setulose on apical half.

Female (description transcribed from Hennig) more heavily pollinose than the male. Frontal stripe narrow, at its narrowest not as broad as the parafrontals, parafrontals not strongly convex on inner margin, equally broad throughout. Abdomen ash-grey, unmarked. Wings clear. Fore tibia with weak ad., no pvs. on hind tibia.

Type and type locality

Karnten (Villach), Germany. Type (of *insignis*) in the Zoologische Museum, Berlin, Germany.

Type locality of *vesparia*: Chester, England. Type apparently lost.

Remarks

The species is associated with wasps. The type of *vesparia* was taken from a nest of *Vespa* (= *Vespula*) *germanica* (Fab.) and Ringdahl (1914) records it from the nest of *Vespa* (= *Vespula*) *vulgaris* (L.).

It is known in Europe from southern Scandinavia and England south to Austria and Italy.

There is only one specimen, a damaged male, known from this country, labelled Tulare Co., California. It has both hind legs and the abdomen missing, but matches the European description in the remaining characters.

Fannia presignis, new species

Fig. 160

This species is obviously close to *insignis*, but differs most strikingly in being densely brown-pollinose, with brown squamae and halteres, infuscated wings, longer and more slender legs, and long hind-femoral posteroventrals.

It differs in detail from *insignis* as follows:

Male

Head.–Frontal bristles about 10. Parafrontals brown-pollinose.

Thorax.–Squamae, haltere, and wing distinctly browned. Sternopleural thorn more slender.

Legs.–F_1 pvs. long and slender, quite weak basally. C_2 spine much more slender. F_3 pvs. slender, two-thirds as long as femoral diameter. T_3 bristling sparser and weaker. All femora distinctly longer and more slender.

Abdomen.–Missing in type.

Female

Head and *Thorax.*–as described for *fuscula.*

Abdomen.–Subshining black, only faintly pollinose, no trace of a median vitta.

Legs.–Entirely black, the knees only slightly paler. Bristled as described for *fuscula.*

Types

Holotype.– ♂, Ottawa, Ontario, 21.VI.1947 (G. E. Shewell) (C.N.C. No. 6648).

Allotype.– ♀, Cartwright, Labrador, 19.VII.1955 (E. F. Cashman).

mutica Group

This group includes only three closely related species. Its affinities are rather obscure, since the species show little specialization. Externally they closely resemble the *scalaris* group. However, in genitalic structure of both male and female, they appear to have closer affinity with the *pretiosa, lugubrina,* and *hirticeps* groups.

The *mutica* group is separated from the others by the full row of anterodorsal setulae and the partial row of posterior hairs on the hind tibiae. Partly distinctive are the two to five hind-tibial anteroventrals, evenly triserial acrostical bristles, and the full row of postoccipital bristles.

In bristling, only the basally developed posterior row of bristles of the male hind tibia separates this group from the *scalaris* and *canicularis* groups.

Male

Head.–Frontal bristles 12 to 16. Parafrontals contiguous, variable in width and coloration. Parafacials without setulae. Occipital bristles variable. Postoccipital bristles in a complete or partial row. Second antennal segment with one or two strong bristles, third twice as long as wide or slightly longer. Arista subpubescent. Palpus linear, theca slender (about three times as long as broad), pollinose, weakly sclerotized.

Thorax.–Black, nonvittate, weakly pollinose. Acr. bristles triserial, the median row weaker. Accessory setulae, including intraalars, variable. Prealars two, distinct, subequal. Stigmatal setulae four to 12. Mesopleural setulae numerous, dorsal row not differentiated. Two rows of (discal) setulae on scutellum above marginals. Squamae subequal, the lower projecting, variable in color; haltere yellow to yellowish-brown; wing clear to lightly infuscated.

Abdomen.–Slightly more than half as long as broad. Grey- to brown-pollinose, the median vitta distinct and triangulated (vague caudally in some specimens of *mutica*).

Legs.—Black except in *oregonensis*, where legs are quite reddish. F_1 pvs. strong to base. T_1 usually with no ad. F_2 avs. with three to five widespread bristles on basal two-fifths equal to femoral width, then four closer-spaced, and a preapical comb of eight to 15; pvs. with the basal scarcely differentiated, followed by 10 to 16 decreasing from 1.5 to 0.7 times femoral width, then a shorter comb of 12; pvs. duplicated ventrally by short bristles from two-fifths to four-fifths. T_2 evenly increasing apicad to 1.5 times basal width, ventral mat similarly increasing; medially with one ad., one pd. Mt_2 normal. C_3 with two hairs posterodorsally. F_3 normal in shape; avs. as a row of erect setulae to apex with two to five stronger preapically; pvs. as erect or prostrate setulae on basal two-thirds. T_3 avs. two to five (rarely one in *mutica*) medially, ads. about 12 with only one stronger, posterior bristles (definitely more posterior than pv.) distinct on basal two-thirds, from 1.0 to 2.5 times tibial width.

Hypopygium.—Evenly and lightly setulose with strong bristles in a row at the base of the surstylus. Cercal plate moderately elongate, apical bristles strong. Surstylus sublateral, connected only next to cercal plate, simple or with inner basal process. Bacilliform process furcate from the base, one arm straight, the other distinctly curved. Ninth sternum simple, aedeagus weakly sclerotized. Fifth sternum broader than long, the bristling only slightly concentrated toward posterior margin.

Female

Coloration and pollinosity generally as in the male.

Head.—Parafrontals normal in shape, pollinose; setulae uniserial. Parafacials without reflecting spot, bare. Occipital bristles short, regular. Postoccipital bristles present as a full or partial row. Third antennal segment broad (0.25 by 0.40 mm.). Theca and palpus as in the male.

Thorax.—As in the male.

Abdomen.—Lightly pollinose, subglossy.

Legs.—F_1 pvs. strong at most on apical half, subsetulose basally. F_2 normal, setulae suberect. T_2 medially with no or one av., one ad., one pd. C_3 setulose (setulae absent occasionally in *oregonensis*). F_3 normal. T_3 with one to three avs., full row ads.

Ovipositor.—Length normal; subanal plate usually broader than long, discal area bare; cercus faintly broader than normal. Eighth tergum normal or reduced medially, sternum basally with a lateral, apodeme-like process, apically with a few bristles, and somewhat divided to form slightly protruding pads. Sixth and seventh sterna broader than long, with only marginal bristles. Spiracles usually both in sixth tergum, rarely in membrane just caudad of it. Spermathecae three, smooth and spherical except in *mutica*, where they are slightly elongate and weakly ringed. Duct base usually weakly sclerotized and faintly curved.

Larva

No larva of this group is as yet known to me.

***Fannia mutica* (Zetterstedt)**

Figs. 13, 16, 163

Aricia mutica Zetterstedt, 1845, p. 1580.

Homalomyia mutica, Schiner, 1862, p. 565; Meade, 1882, p. 204; Stein, 1895, p. 122; Meade, 1897, p. 66; Pandellé, 1899, p. 188; Wingate, 1906, p. 283.

Fannia mutica, Stein, 1907a, p. 662; Malloch, 1912a, p. 206; Ringdahl, 1912, p. 214; Stein, 1913, p. 25; Stein, 1915, p. 136; Frey, 1916, p. 691; Stein, 1916, p. 81; Séguy, 1923, p. 272, Figs.

518, 519; Karl, 1928, p. 66, Figs. 45, 46; Ringdahl, 1928, p. 27; Thornley, 1931, p. 91; Audcent, 1932, p. 365; Stackelberg, 1933, p. 526; Ringdahl, 1934a, p. 115; Tiensuu, 1935, p. 45; Tiensuu, 1936, p. 165; Karl, 1937, p. 128; Ringdahl, 1939, p. 43; Ringdahl, 1948, p. 17; Grensted, 1949, p. 167; Ringdahl, 1951, p. 167; Ringdahl, 1952, p. 156; Ringdahl, 1954a, p. 74; Hennig, 1955, p. 63, Figs. 39, 80.

Aminta brunipennis Robineau-Desvoidy, 1830, p. 570 p.p.; syn. *teste* Stein, 1907.

Aricia lugens Zetterstedt, 1845, p. 1578; syn. *teste* Stein, 1895; Ringdahl, 1939.

Homalomyia triangulifera Rondani, 1866, p. 130; Rondani, 1877, p. 51 p.p.; syn. *teste* Stein, 1895.

Homalomyia nigrisquama Meade, 1877, p. 253; syn. *teste* Stein, 1897, 1907a.

A dark-brown-pollinose species, separated from the other species of the group by the yellow to brown squamae and the presence of one to three hind-tibial anteroventral bristles in the male, and the mid-tibial anteroventral bristle in the female. Length 4.5-5.5 mm.

Male

Head.—Parafrontals very narrow (0.03 increasing to 0.06 mm.), dark-brown-pollinose. Occipital bristles fine, short, distinctly alternating. Postoccipital bristles in one row, incomplete dorsally. Second antennal segment with one bristle.

Thorax.—Accessory setulae numerous, slender; intraalars in two or three rows, irregular. Stigmatal setulae 10 to 12. Squamae yellow to brown. Haltere yellowish-brown.

Abdomen.—Broad (1.8 by 2.0 mm.). Brownish-pollinose, the median vitta moderately distinct, in some specimens obscured by heavy pollen on posterior segments.

Legs.—Black, not even knees yellowish. F_3 with only two strong preapical avs.; pvs. prostrate, weak. T_3 avs. two (more rarely one or three), median posterior bristles as long as tibial diameter.

Hypopygium.—Cercal plate broad, weakly elongate, apically weakly bilobed and with three pairs of strong bristles. Surstylus quite broad, sharply tapered apically, broadly confluent with the ninth tergum basally, and with four strong bristles along the basal suture. Bacilliform process with the dorsal arm very long and curved; ventral arm small, inconspicuous.

Female

Legs.—Black, not even the knees yellowish. F_1 pvs. strong on apical half. T_2 with distinct av. T_3 avs. one or two.

Type locality and type

South and Central Sweden (Lund, Gotland). Type in the Zoologiska Institution, Lund, Sweden.

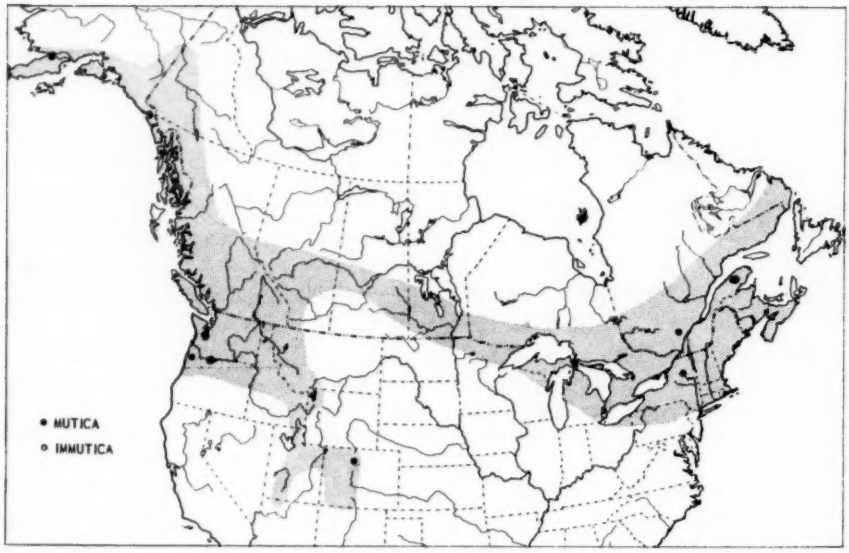
Remarks

This species has been reared from fungus in Scotland (Malloch, 1912a) and the adults associated (Tiensuu, 1936) with aphid-infested plants.

It is widespread in Europe from Italy to northern Norway, but is rare in North America, and generally restricted to mountainous areas.

Records, 7 ♂♂, 5 ♀♀ (Map 10)

ALASKA. King Salmon, Naknek R., 2 ♀♀. BRITISH COLUMBIA. Queen Charlotte, Q.C. Is., 1 ♀. OREGON. Neskownin, 1 ♂. WYOMING. Lake Junction, Yellowstone Park, 1 ♂. COLORADO. Red Mt. (10,000 ft.). MICHIGAN. Isle Royale, 2 ♀♀. QUEBEC. Lac Jacques Cartier, Parc Laurentides (2600 ft.), 1 ♂; Mt. Albert, 2 ♂♂. NEW YORK. Avalanche Trail, Adirondacks, 1 ♂.



Map 10. Geographic distributions of *F. mutica* (Zett.) and *F. immutica* Collin.

Collecting dates from July 4 to August 18.

I have also seen 24 specimens of this species from England, Germany, Sweden, Italy, and Austria.

Fannia immutica Collin

Figs. 14, 17, 165

Fannia immutica Collin, 1939, p. 142, Fig. 3; Hennig, 1955, p. 51, Figs. 36, 79; Collin, 1958, p. 91.

This species is closely related to *mutica*, but can be distinguished by the grey-pollinose head and abdomen, pale squamae, and the presence of long posterior bristles on entire basal half of hind tibia. Length 6.0-6.5 mm.

Male

Head.—Parafrontals broad (0.04 increasing to 0.14 mm.), silvery-pollinose. Occipital bristles long, very irregular. Postoccipital bristles in a complete row extending to vertical bristles. Second antennal segment with two bristles.

Thorax.—Bristling as described for *mutica*. Squamae clear whitish, the margin yellowed. Haltere yellow.

Abdomen.—Narrow (2.0 by 3.5 mm.). Grey-pollinose, the median vitta distinct and triangulated.

Legs.—Black, not even knees yellow. F_3 with three to five stronger avs. apically, pvs. short setulose as in *mutica*. T_3 avs. three to five (normally four), irregularly placed; posterior bristles 2.5 times tibial diameter.

Hypopygium.—Cercal plate rather elongate, not bilobed apically, and with only weak apical bristles. Surstylus slender, evenly tapering, broadly confluent basally with the ninth tergum, and with only weak bristles along the suture. Bacilliform process with dorsal arm curved, ventral arm straight and fairly short.

Female

Legs.—Black, tibiae often reddish. F_1 pvs. strong only on apical third. T_2 with no av. T_3 with two or three avs.

Type and type locality

Musselburgh, near Edinburgh, Scotland. Type in Collin's collection, Newmarket, England.

This species has been reared from fungus (Collin, 1939). It has previously been recorded only from two localities in Scotland, and its distribution is now extended to the mountainous areas of North America.

Records, 7 ♂♂, 3 ♀♀ (Map 10)

QUEBEC. Mt. Albert, 1 ♂. WASHINGTON. Tacoma, 3 ♂♂, 3 ♀♀. OREGON. Boyer, 3 ♂♂.

Collecting dates from July 30 to August 27.

Fannia oregonensis, new species

Figs. 15, 18, 164

This species appears at first glance to be only a yellowish form of *immutica,* with the legs (at least the tibiae) reddish-brown, the knees distinctly yellowish. However, several minor bristle differences and a distinct difference in genitalic structure identifies it as a distinct species. Length 5.5-6.0 mm.

Male

Head.—Parafrontals slightly narrower than in *immutica* (0.03 increasing to 0.10), silvery-pollinose. Occipital bristles laterally unusually short and regular. Postoccipital bristles absent on dorsal half, irregularly scattered ventrally. Second antennal segment with one bristle.

Thorax.—Accessory setulae quite short and sparse, the intraalars at most uniserial. Stigmatal setulae four to six. Squamae and haltere as described for *immutica.*

Abdomen.—Identical, except for genitalia, with *immutica.*

Legs.—Reddish-brown, tarsi black; in some northern specimens the femora are largely infuscated. F_3 with avs. as described for *immutica,* pvs. erect and strong, three-fourths femoral diameter on basal half. T_3 bristled as described for *immutica.*

Hypopygium.—Cercal plate short and broad, apically bilobed, and with two pairs of strong bristles. Surstylus slender, evenly tapering, not broadly confluent basally with the ninth tergum, and with two strong basal bristles. Bacilliform process with both arms short, dorsal arm straight, ventral arm curved dorsally.

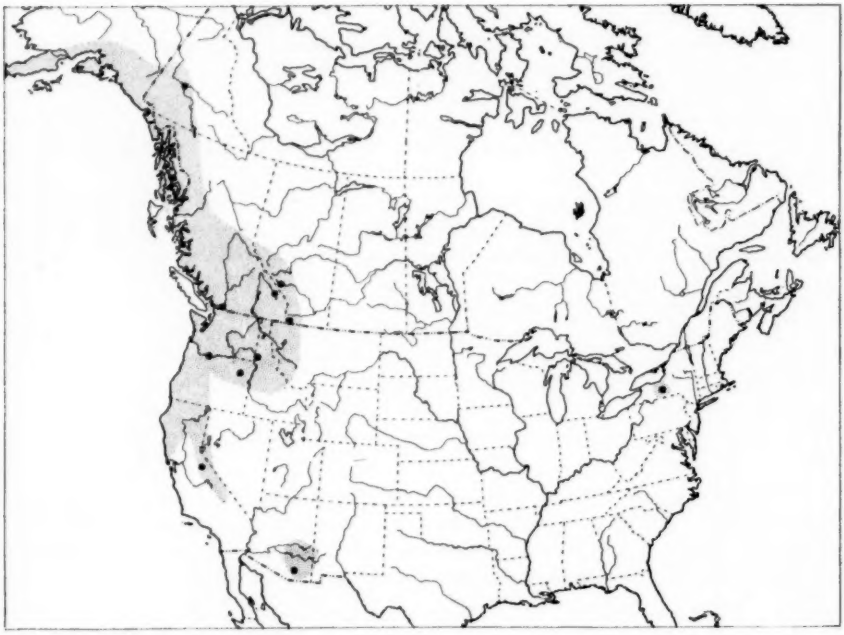
Female

Black, legs (except tarsi) distinctly reddish. Postoccipital row absent on dorsal half. F_1 pvs. strong on apical half. T_2 with no av. T_3 with two or three avs. C_3 bristles often weak or absent.

Types

Holotype.— ♂, Hood River, Oregon (Child's Coll.), 1.VII.1917 (C.N.C. No. 6649).

Allotype.— ♀, Bumble Bee, Tuolomne Co., California, 8.VII.1951 (T. H. Haig).



Map 11. Geographic distribution of *F. oregonensis* Chill.

Paratypes.—7 ♂♂, 16 ♀♀ as follows: BRITISH COLUMBIA. 1 ♂, Trinity Valley, 16.VI.1937 (H. B. Leech); 1 ♀, Carbonate, Columbia R. (2600 ft.), 7-12.VII.1908 (J. C. Bradley). ALBERTA. 1 ♂, Banff, 26.VI.1925 (O. Bryant); 1 ♂, Moraine Lake, 2.VII.1925 (O. Bryant). OREGON. 1 ♂ (same data as holotype); 1 ♀, Haines, 10.VII.1931 (M. W. Sanderson). IDAHO. 1 ♀, Laird Park, near Harvard, 24.VI.1949 (M. T. James). CALIFORNIA. 14 ♀♀ (same data as allotype). ARIZONA. 2 ♂♂, Bear Wallow, Santa Catalina Mts. (32° 25.3′, 110°44′) (8000 ft.), 12-17.VII.1916.

Additional Records (Map 11)

YUKON. 2 ♀♀, Selkirk, 13.VI.1919 (H. G. Dyar). NEW YORK. 1 ♀, Bog A, Mclean Reserve, 22.VII.1924.

Remarks

Except for the single eastern record, which, based on a female, may be in error, this species is restricted to the western mountain ranges from the Yukon to California and Arizona. There is no information on its biology.

lugubrina Group

This group is rather homogeneous—only *genualis* is unusual—and is set apart by several distinctive characters from the other groups. Its closest relatives are in the *hirticeps* group, but the slender, sclerotized proboscis, haired hind coxae, and fused bristle-ridge ventrally on the mid metatarsus clearly distinguish it. Five species: *lugubrina, tuberculata, falcata, hinei,* and *genualis,* are known from North America.

Male

Head.—Frontal bristles nine to 13. Parafrontals linear, variable in color, almost contiguous. Parafacials without setulae. Occipital bristles variable. Postoccipital bristles absent, except in *lugubrina.* Second antennal segment with a single strong bristle, the third usually quadrate. Arista subpubescent, usually distinctly thickened basad. Palpus linear; theca glossy, quite long and narrow, over four times as long as broad.

Thorax.—Greyish-brown- to black-pollinose, nonvittate. Acr. bristles biserial throughout, the bristles close-set anteriorly. Accessory setulae usually long and numerous, quite short and sparse in *genualis.* Prealars two, subequal, short (absent in *genualis*). Stigmatal setulae variable. Mesopleural setulae variable in number, dorsal row scarcely stronger. Scutellum normally with the discal area bare (setulose only in *lugubrina*). Squamae subequal with the lower projecting, variable in color; haltere yellow; wing clear or brownish.

Abdomen.—Two-thirds as broad as long. Pollen blue-grey, median vitta triangulated and distinct in all but *lugubrina,* which is brownish-pollinose with the markings obscured.

Legs.—Black, paler with knees yellow in *genualis* and *falcata.* F_1 pvs. as a complete row of long, fine bristles. T_1 ads. one or none. F_2 bristling moderately differentiated, weakly so in *genualis;* avs. 10 long, equal to femoral width basally, gradually shorter and closer together, changing to a more or less doubled comb, a break, and a preapical comb of five setulae; pvs. longer and finer, more or less doubled for entire length with a weak to strong preapical clump. T_2 simple in *genualis,* medially tuberculate in *tuberculata;* usually strongly flattened with a posteroventral carina on basal half, normally rounded and only slightly thickened on apical half; ventral mat distinct on apical half, half as long as tibial diameter; medially with one or two ads. and pds. Mt_2 with the ventral hairs fused along entire length, more or less consolidated, normally setulose only in *genualis.* C_3 with one or two small hair-like bristles posterodorsally. F_3 normal in shape; avs. present as a complete row, short and setulose on basal third, increasing gradually to femoral width; pvs. variable, present only on basal two-thirds, setulose in *genualis,* in the other species increasing apicad to form a more or less distinct clump of fine bristles longer than femoral width, occasionally situated on a weak tubercle. Usually T_3 medially with one av., one ad., but some specimens of *lugubrina* lacking the av., and some specimens of *falcata* having two avs.

Hypopygium.—Conspicuous except in *genualis.* Cercal plate elongate, usually broadened and flattened, always with a pair of strong ventral bristles preapically. Surstylus articulated medially; broad and simple in some species, with less commonly an inner basal process; strongly hooked apically in *falcata* and *hinei* with a dorsal preapical process in *genualis.* Bacilliform process short and curved ventrally, often very broad, in *tuberculata* furcate apically, in *falcata* completely absent. Ninth sternum simple; aedeagus weakly or, in *lugubrina,* moderately sclerotized. Fifth sternum distinctly broader than long, the bristles well-differentiated and crowded caudad.

Female

Coloration and pollinosity generally as in the male.

Head.—Parafrontals broad, often approaching twice the width of the frontal vitta, strongly convex on inner margin, subshining to fully pollinose; setulae in one or two irregular rows. Otherwise as in the male.

Thorax.—Thorax dark, only sparsely pollinose, the setulae sparser and shorter than in the male.

Abdomen.—Subshining, intersegmental membrane glossy black.

Legs.—T_1 with zero to two ads., zero or one pd. F_2 av. row strong, the bristles half as long as femoral width basally, setulose apically; pv. row similar, the stronger bristles more restricted basad. T_2 with zero to two avs., one or two ads., one or two pds. Mt_2 unmodified. C_3 with two hairs as in the male. F_3 avs. in a complete row, strongest at two-thirds; pvs. setulose to apex. T_3 with one or two avs., one ad.

Ovipositor.—Quite variable in structure. Subanal plate distinctly short and broad, discally bare or weakly setose. Cercus normal. Eighth tergum either normal, reduced and broken medially, or strong with a distinct mid-dorsal apodeme; sternum always divided along the mid-line, never into anterior and posterior portions; variable from a small pair of setose plates to elongate plates somewhat divided basad. Sixth and seventh terga normal. Sixth and seventh sterna truncated or evenly rounded apically. Spiracles six and seven both in the membrane or one or other located in sixth tergum; rarely the seventh in seventh tergum. Spermathecae spherical or slightly elongate, smooth, with a slight bump or depression at the tip. Duct base swollen and curled, fairly short.

Larva

Integument granulate or minutely tuberculate, distinctly spiculate on restricted areas in *?falcata*; these protuberances forming more or less distinct rows sometimes delimiting polygonal bare areas. Laterodorsal processes moderately strong, with simple to trifurcate lateral projections on basal third to half (weakly developed on thoracic segment), lateral pair on caudal segment distinctly longer than caudal pairs; lateroventral processes absent or represented by very short stubs; dorsal processes absent or very short; dorsolateral processes not apparent. Cephalic and lateral processes of first thoracic segment absent or long and distinct. Anterior spiracular processes distinct but short, six to eight in number. Posterior spiracular stalk situated on or very near the lateral margin, short, the spiracular processes usually short, irregular in position and unequal in length, not in a distinct radial arrangement. Mouth hooks moderately developed (*genualis*) to distinctly atrophied (*? falcata*).

Description based on single specimens of *genualis* and *? falcata* and a published figure and description of *tuberculata*.

***Fannia lugubrina* (Zetterstedt)**

Figs. 19, 24, 166, 265

Anthomyza lugubrina Zetterstedt, 1838, p. 687.
Aricia lugubrina, Zetterstedt, 1845, p. 1596.
Homalomyia lugubrina, Stein, 1895, p. 105.
Fannia lugubrina, Stein, 1907a, p. 661; Ringdahl, 1928, p. 26; Ringdahl, 1934a, p. 116, Figs. 8, 9; Tiensuu, 1935, p. 44; Ringdahl, 1939, p. 43; Ringdahl, 1944a, p. 17; Ringdahl, 1951, p. 167; Ringdahl, 1952, p. 156; Ringdahl, 1954a, p. 71; Ringdahl, 1954b, p. 50; Hennig, 1955, p. 59, Figs. 33, 96.
Aricia albinervis Zetterstedt, 1845, p. 1557; syn. *teste* Stein, 1892, p. 221; and Ringdahl, 1929, p. 142.

A black species with dark-brownish pollen, not even the knees yellow. Distinguished from other species of the group in the male by the long hind-femoral posteroventrals forming an open fascicle at four-fifths with bristles twice as long as femoral width. Length 4.5 to 5.0 mm.

Male

Head.—Frontal bristles nine to 11, with several finer interstitials. Occipital bristles long, fine, quite irregular. Postoccipital row of bristles nearly complete.

Thorax.—Dark brownish-black-pollinose. Accessory setulae long and numerous. Pra. two, subequal, small. Stigmatal and mesopleural setulae long and numerous. Scutellar disc setulose. Squamae pale, margins yellow. Wing membrane brownish.

Abdomen.—Brownish-pollinose, the markings largely obscured.

Legs.—Tibiae black. T_1 with zero to two weak ads. F_2 bristling moderately differentiated. T_2 with two ads., one pd. F_3 avs. and pvs. setulose and fine, with 12 to 15 long fine bristles on distinct tubercle at three-fourths, gradually fading out to setulae basally. T_3 occasionally lacking the av. bristle.

Hypopygium.—Cercal plate long and slender, not apically expanded. Surstylus equally broad throughout, with apical projections. Bacilliform process short and slender.

Female

Head.—Parafrontals subshining, sparsely but evenly pollinose, setulae irregularly uniserial. Occipital row somewhat irregular dorsad. Postoccipital row of bristles complete to verticals, irregular.

Thorax.—Strongly subshining, the accessory setulae short, moderate in number. Stigmatal setulae three or four.

Legs.—T_1 occasionally with a weak ad. and no p. bristle. F_2 avs. five or six strong (half as long as femoral width) on basal half, then five to seven setulae to apex; pvs. with three or four strong on basal third, setulose to apex. T_2 with one (rarely two) avs., two ads., one pd. F_3 avs. in a full row, evenly increasing in length to apex. T_3 with one (rarely two) avs., one ad.

Type locality and type

Juckasjarvi, Bjorkvin, Norway. Type in Zoologiska Institution, Lund, Sweden.

Remarks

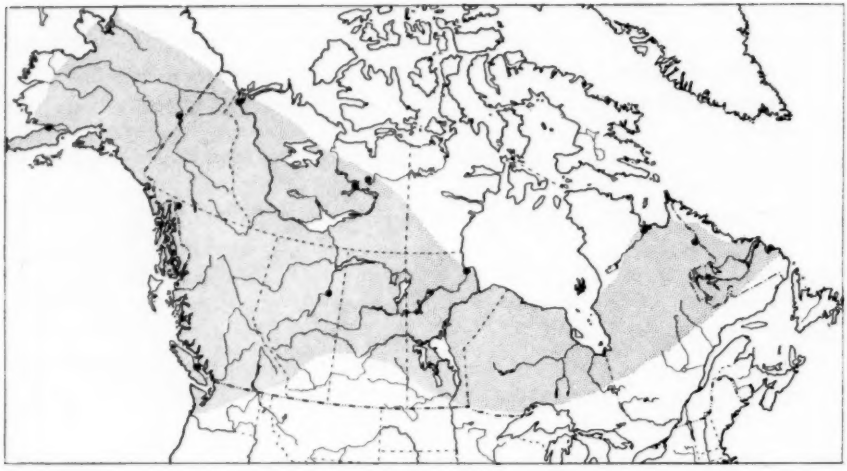
There are no known reports on the biology of this species. It is known in Europe only from northern Scandinavia and has been described by Ringdahl as an arctic-high boreal species. Its distribution in Canada bears this out, as most records are from along tree-line.

Records, 37 ♂♂, *53* ♀♀ (Map 12)

ALASKA. Big Delta, 1 ♂; King Salmon, Naknek R., 2 ♀♀; on tundra, Naknek, 1 ♂, 3 ♀♀. NORTHWEST TERRITORIES. Aklavik, 2 ♂♂, 1 ♀; Salmita Mines, 5 ♂♂, 3 ♀♀; Muskox Lake, 5 ♂♂, 12 ♀♀. BRITISH COLUMBIA. Atlin (2200 ft.), 1 ♀. ALBERTA. McMurray, 1 ♂; Sunwapta Pass (Banff National Park) (6700 ft.), 2 ♀♀. MANITOBA. Fort Churchill, 5 ♂♂, 2 ♀♀; Churchill, 4 ♂♂, 5 ♀♀; Mile 505, Hudson Bay R.R., 1 ♂, 1 ♀. QUEBEC. Fort Chimo, 1 ♂, 2 ♀♀; Indian House Lake, 10 ♂♂, 14 ♀♀. LABRADOR. Cartwright, 1 ♂, 5 ♀♀.

Collecting dates from July 4 to August 26, with the majority in early July.

I have also seen 2 ♂♂ and 1 ♀ from Sweden.



Map 12. Geographic distribution of *F. lugubrina* (Zett.).

Fannia tuberculata (Zetterstedt)

Figs. 20, 25, 167, 234, 263

Aricia tuberculata Zetterstedt, 1849, p. 3296.
Homalomyia tuberculata, Stein, 1895, p. 77; Pandellé, 1899, p. 191; Wingate, 1906, p. 281.
Fannia tuberculata, Stein, 1907a, p. 665; Strobl, 1910, p. 166; Stein, 1913, p. 25; Stein, 1916, p. 81; Kramer, 1917, p. 41; Séguy, 1923, p. 274, Fig. 509; Karl, 1928, p. 64; Ringdahl, 1928, p. 26; Lindroth, 1931, p. 324; Stackelberg, 1933, p. 526; Ringdahl, 1934a, p. 115; Tiensuu, 1935, p. 44; Karl, 1937, p. 129; Ringdahl, 1951, p. 166; Ringdahl, 1952, p. 158; Nielson, Ringdahl, and Tuxen, 1954, p. 120, Fig. 32; Ringdahl, 1954a, p. 74; Hennig, 1955, p. 89, Figs. 38, 105.

A species closely related to *lugubrina*, but more grey-pollinose, with the abdominal markings distinct. The distinct glossy tubercle ventrally before the middle of the mid tibia is a distinguishing character. Length 4.5 to 5.5 mm.

Male

Head.—Frontal bristles nine to 11, with several interstitials. Occipital bristles regular, quite short laterally. Postoccipital bristles absent.

Thorax.—Dark brownish-grey-pollinose. Accessory setulae moderately long and numerous. Pra. two, small, subequal. Stigmatal setulae five or six. Mesopleural setulae moderate in strength and number. Scutellar disc bare. Squamae pale, margins concolorous with discs. Haltere yellow. Wing membrane clear.

Abdomen.—Bluish-grey-pollinose, the markings distinct.

Legs.—Tibiae black. T_1 with zero or one ad. F_2 pvs. strongly doubled beyond the middle to form a strong elongate preapical clump. T_2 with a striking glossy tubercle developed subbasally (see Fig. 234); one or two ads. and pds. F_3 avs. with several bristle-like setulae developed medially; pvs. with an elongate clumping of bristles at apical fourth, but not on a distinct tubercle.

Hypopygium.—Cercal plate long and slender, apically expanded and with two ventrolateral processes. Surstylus broad and flattened, with only weak processes preapically. Bacilliform process short, weakly bifurcate.

Female

Head.—Parafrontals evenly grey-pollinose, setulae sparse and irregularly uniserial. Occipital bristles short, regular. Postoccipital row of bristles absent.

Thorax.—Distinctly grey-pollinose, scarcely shining. Accessory setulae moderate, short. Stigmatal setulae one or two.

Legs.—Tibiae black. T_1 with one ad., no p. bristle. F_2 avs. strong on basal two-thirds; pvs. strong on basal half, setulae suberect to apex. T_2 with one av., one or two ads., one pd. F_3 with full row of avs., increasing from half femoral width basally to two or three strong preapical bristles longer than femoral width. T_3 with one or two avs., one ad.

Larva

(Based on figure and description in Nielsen et al., 1954).

Integumental pattern not discernible in figure, but probably similar to that of ? *falcata*. Laterodorsal processes probably with simple lateral projections. Thoracic segments with distinct short dorsolateral processes near the base of the laterodorsals. Cephalic and lateral processes of first thoracic segment distinct. Characters of spiracles and mouth hooks not known.

Type locality and type

Denmark. Type in Zoologiska Institution, Lund, Sweden.

Remarks

There are no definite reports on the biology of this species except for an association in Greenland (Nielsen et al., 1954) with bogs. My own collecting data from along tree-line in North America associate it with wet willow scrub and marshy meadows.

It is much more widespread in Europe than is *lugubrina*, having been recorded from Scandinavia, the British Isles, Germany, Austria, and Czechoslovakia. In western North America it occurs with *lugubrina*, but is usually rarer and apparently more restricted to northern areas.

Records, 21 ♂♂, 7 ♀♀ (Map 13)

ALASKA. Nome, 11 ♂♂, 5 ♀♀; on tundra, Naknek, 1 ♂, 1 ♀; King Salmon, Naknek R., 1 ♀. NORTHWEST TERRITORIES. Aklavik, 1 ♂; Muskox Lake, 9 ♂♂, 4 ♀♀; Salmita Mines, 2 ♂♂, 1 ♀.

Collecting dates from June 15 to July 25.

I have seen European specimens from Äre, Sweden (1 ♂, 1 ♀).

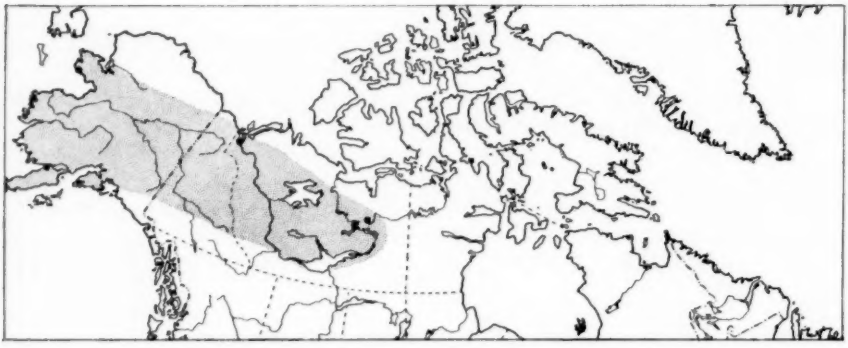
***Fannia genualis* (Stein)**

Figs. 21, 26, 168, 276

Homalomyia genualis Stein, 1895, p. 126; Meade, 1897, p. 67; Pandellé, 1899, p. 192; Wingate, 1906, p. 283.

Fannia genualis, Stein, 1907a, p. 659; Malloch, 1913a, p. 630; Stein, 1913, p. 25; Ringdahl, 1914, p. 146; Stein, 1916, p. 87; Kramer, 1917, p. 41; Séguy, 1923, p. 270; Malloch, 1924a, p. 516; Karl, 1928, p. 65; Ringdahl, 1928, p. 16; Audcent, 1932, p. 365; Stackelberg, 1933, p. 526; Ringdahl, 1934a, p. 116; Karl, 1937, p. 128; Tiensuu, 1938, p. 31; Ringdahl, 1951, p. 167; Ringdahl, 1952, p. 156; Ringdahl, 1954a, p. 75; Hennig, 1955, p. 44, Figs. 43, 99.

This species is rather distinct externally and in genitalic characters from the other species of the group. The lack of a prealar bristle, and the unmodified middle legs of the male are characters clearly distinguishing it from other species of the group. However, it has frequently been confused with two strictly



Map 13. Geographic distribution of *F. tuberculata* (Zett.).

Nearctic species which closely resemble it in coloration, but which are easily distinguished from it as mentioned above. Length 4.5-5.0 mm.

Male

Head.—Frontal bristles 11 to 13, with few interstitials. Occipital bristles short, regular. Postoccipital bristles absent.

Thorax.—Prealar area completely bare. Accessory setulae quite sparse, short. Otherwise as described for *tuberculata.*

Abdomen.—As described for *tuberculata.* Hypopygium inconspicuous.

Legs.—Tibiae distinctly yellow basally and (narrowly) at apex. T_1 ad. setulose or absent. T_2 bristling scarcely differentiated. T_2 unmodified (no basal crest), one ad., one p. F_3 pvs. and ps. shorter and sparser, extending only to four-sevenths, with a ventral row of stronger setulae.

Hypopygium.—Cercal plate rather short and broadened, apically with a trilobed dorsal expansion and a ventral process. Surstylus moderately slender basally, expanded apically and with a long dorsal finger-like process preapically. Bacilliform process basally bifurcate, the inner arm curved.

Female

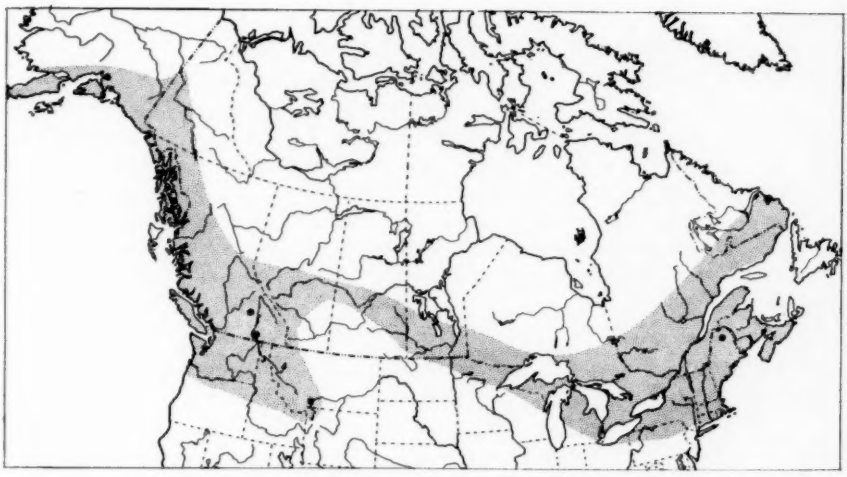
Head.—Parafrontals evenly grey-pollinose, setulae uniserial. Occipital bristles short, regular. Postoccipital bristles absent.

Thorax.—As in the male.

Legs.—T_1 with short ad. and strong p. bristle. F_2 avs. weak, distinct on basal half, pvs. distinct on basal fourth. T_2 with one av., one ad., two pds. F_3 avs. apically with three long evenly spaced bristles with two or three shorter bristles between each. T_3 with one av., one ad.

Larva (Fig. 276)

Integument densely granulate, without spicules, without distinct patterning or polygonal bare areas. Laterodorsal processes with anterior projections numerous and weakly trifurcate, posterior projections few, strong and simple, the processes on third thoracic segment with distinct posterior projections; dorsal processes very short, present only on a few posterior segments. Cephalic and lateral processes of first thoracic segment apparently absent. Posterior spiracular stalk situated just in from the margin, its processes short with only the posterior



Map 14. Geographic distribution of *F. genualis* (Stein).

one distinct. Mouth hooks well developed, but distinctly more slender than in *canicularis* or *scalaris*.

Description based on one associated puparium from Matanuska, Alaska.

Type locality and type

Genthin, Germany. Type in Zoologische Museum, Berlin, Germany.

Remarks

The only record on the biology associates this species with aquatic plants (Ringdahl, 1934). A specimen before me has been reared from soil in a lettuce patch in Alaska.

It is known in Europe from the same localities as *tuberculata*: Scandinavia, British Isles, France, Germany, and Czechoslovakia. In North America, it is distinctly more southern than *tuberculata*, and is rare throughout the entire range.

Records, 6 ♂♂, 5 ♀♀ (Map 14)

ALASKA. Matanuska, 1 ♀ (reared from soil in lettuce patch). BRITISH COLUMBIA. Vernon, 1 ♂; Oliver, 1 ♂. MONTANA. Bozeman (Mont. Expt. Sta.), 2 ♀♀. NEW HAMPSHIRE. White Mts., 1 ♂. LABRADOR. Cartwright, 3 ♂♂, 3 ♀♀.

Collecting dates from June 6 to August 13.

I have also seen three males from England and Scotland.

Fannia falcata, new species

Figs. 22, 27, 169, 286

This species has commonly been misidentified in this region as *genualis* Stein, but the presence of distinct prealar bristles, and, in the male, a fused bristle ridge on the mid metatarsus and the swollen hypopygium separates this species from all others of the group except *hinei*, which has a different genitalic structure in both male and female. The grey-pollinose body and yellowish tibiae separate it from all but *genualis*. Length 4.5 mm.

Male

Head and *Thorax.*—As in *tuberculata.*

Abdomen.—Grey-brown-pollinose, the markings moderately distinct.

Legs.—Variable from only knees yellow to entire tibiae yellow. T_1 ad. distinct. F_2 bristling moderately differentiated. T_2 with one or two ads., one pd. F_3 pvs. much as in *tuberculata,* a little shorter and more dispersed. T_3 with one (occasionally two) avs., one ad.

Hypopygium.—Cercal plate broad throughout, with two short laterodorsal flanges. Surstylus slender, sharply geniculate beyond the apex of the cercal plate, the recurved portion slender. Bacilliform process very weakly developed, not usually apparent.

Female

Head and *Thorax.*—As described for *tuberculata,* with the brown thoracic markings often more distinct.

Legs.—T_1 with one ad., one p. F_2 avs. and pvs. strong on basal three-fourths, with three or four setulae on apical fourth. T_2 with one ad., one pd. (often very weak). F_3 as in *tuberculata.* T_3 with one av., one ad.

Larva (Fig. 286)

Integument sparsely tuberculate, with spicules distinct near mid-dorsal line, at base of laterodorsal processes, and in a row between posterior spiracular stalks; on caudal segment often bifurcate and erect; the minute tubercles forming rows outlining bare polygonal areas. Laterodorsal processes with distinctly bifurcate or trifurcate projections on both anterior and posterior surfaces, those on posterior surfaces broad and strong, processes of thoracic segments with very short and weak projections; dorsal processes absent. Cephalic and lateral processes of first thoracic segment distinct. Posterior spiracular stalk situated on margin of segment, its processes short but all three distinct. Mouth hooks greatly atrophied, represented by slender, weakly sclerotized fragments.

Description based on a single larva collected at Fort Severn, Ontario (56°N.) June 18, 1954, from willow-aspen muskeg (Berlese sample) (H. Hansen); tentatively referred to this species on distributional data and morphology.

Types

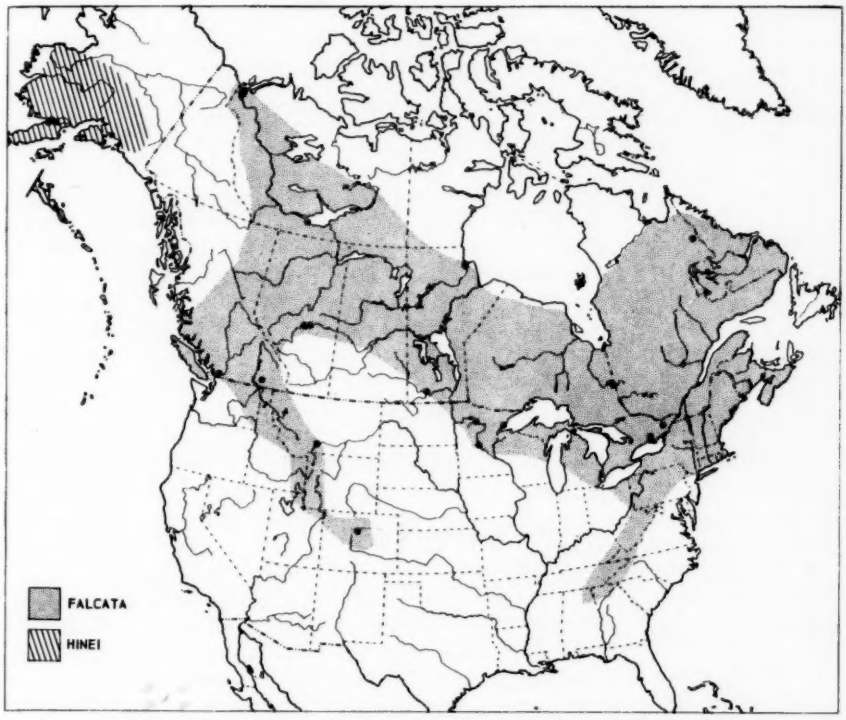
Holotype.— ♂, Farnworth Lake, nr. Churchill, Manitoba, 26.VI.1952 (J. G. Chillcott). (C.N.C. No. 6650).

Allotype.— ♀, same data (C.N.C.).

Paratypes.—10 ♂♂, 4 ♀♀, as follows: MANITOBA. Farnworth Lake, nr. Churchill, 3 ♂♂, 1 ♀, 26.VI.1952 (J. G. Chillcott); Churchill, 2 ♂♂, 25.VI.1948 (G. E. Shewell), 1 ♂, 26.VI.1948 (G. E. Shewell), 1 ♀, 15.VII.1949 (L. A. Miller), 1 ♂, 5.VI.1930 (O. Bryant); Fort Churchill, 2 ♂♂, 19.VI.1952 (J. G. Chillcott), 1 ♂, 23.VI.1952 (C. D. Bird), 1 ♀, 20.VI.1952 (J. G. Chillcott); Warkworth Creek, nr. Churchill, 1 ♂, 29.VI.1952 (J. G. Chillcott).

Additional Records, 13 ♂♂, 17 ♀♀ (Map 15)

LABRADOR. Cartwright, 1 ♂, 2 ♀♀. QUEBEC. Indian House, 1 ♂, 3 ♀♀. MANITOBA. Fort Churchill, 3 ♀♀; Farnworth L., nr. Churchill, 1 ♀. ONTARIO. Marmora, 2 ♂♂; Trenton, 1 ♂; Osgoode, 1 ♀; Ottawa, 1 ♂, 1 ♀; Golden Lake, 1 ♀; Midland, 1 ♀. MINNESOTA. Cass Lake, 1 ♂; Two Harbours, 1 ♂; Cushing, 1 ♂. COLORADO. Webster, 1 ♀. ALBERTA. Wabamun, 1 ♀;



Map 15. Geographic distributions of *F. falcata* Chill. and *F. hinei* Chill.

Edmonton, 1 ♂. MONTANA. Bozeman, 1 ♀. BRITISH COLUMBIA. Steelhead, 1 ♀; Robson, 1 ♂. NORTHWEST TERRITORIES. Hay River, 1 ♀; Aklavik, 1 ♀.

Collecting dates from May 10 to September 11.

Remarks

This species is rather widespread throughout the Canadian and Hudsonian zones in North America with the exception of Alaska, where it is evidently replaced by *hinei*. It has the broadest range in North America of any species of the *lugubrina* group.

Fannia hinei, new species

Figs. 23, 28, 170

As mentioned previously, this species is almost identical with *falcata*, differing only in its genitalic structure and somewhat darker coloration. Length 4.5 mm.

Male

Head and *Thorax*.—As described for *tuberculata* (and *falcata*).

Abdomen.—As described for *falcata*.

Legs.—Tibiae usually much darker with only the knees yellow. T_1 has no ad. bristle. Otherwise as described for *falcata*.

Hypopygium.—Very similar to that of *falcata*, but the cercal plate is much shorter and lacks the flanges, and the surstylus is much broader, including the recurved portion.

Female

Head.–Parafrontal bristles weakly grey-pollinose, subshining; setulae sparse, one-rowed. Occipital bristles short, regular. Postoccipital bristles absent.

Thorax.–As described for *tuberculata* (and *falcata*).

Legs.–As described for *falcata.*

Types

Holotype.– ♂, King Salmon, Naknek R., Alaska, 23.VIII.1952 (W. R. M. Mason) (C.N.C. No. 6651).

Allotype.– ♀, same locality and collector, 6.VII.1952 (C.N.C.).

Paratypes.–3 ♂♂, 4 ♀♀, as follows: ALASKA. King Salmon, Naknek R., 1 ♀, 3.VII.1952; 1 ♀, 13.VII.1952; 1 ♀, 15.VII.1952; on tundra, Cold Bay (163° W.), 1 ♂, 18.VIII.1952; Savonoski, Naknek Lake, 1 ♂, 1 ♀, 27.VII.1919; 1 ♂, June, 1919.

Remarks

To date this species is only known from southwestern Alaska, and there is no information on its biology.

***hirticeps* Group**

This group is fairly closely related to the *lugubrina* group, and, more distantly, to the *postica* group. It is a rather loose assemblage, lacking the homogeneity of the *lugubrina* group even in North America, whereas there are several strictly Palaearctic species which extend the variation.

The genitalic structure is moderately distinct, the female parafrontals are broad with usually biserial setulae, the acrosticals are strictly biserial, the mid-tibial bristles are doubled or trebled, and the hind coxae are bare (except in *barbata* Stein). With few exceptions the postoccipital row is present, the eyes are at least weakly haired, and the male mid metatarsus has a basal crest.

The Nearctic species of this group are *lasiops, hirticeps, ungulata,* and *atra.* Palaearctic species include *cothurnata, nidica, barbata, armata, berolinensis,* and, more doubtfully, *limbata.*

Male

Head.–Frontals seven to 10 (12 to 15 in European *armata*), strong. Parafrontals usually contiguous, silvery-pollinose, narrow near ocellar triangle and broadening rapidly toward antennae. Eyes thickly and distinctly to weakly and scantily haired (exclusive character). Occipital bristles short and regular. Postoccipital bristles present as a full row except in *atra.* Second antennal segment with two or three distinct bristles or only one; third segment normal or almost as broad as long. Arista subpubescent. Palpus linear, theca unmodified, short, subpollinose.

Thorax.–Dark brown, nonvittate. Acr. bristles strictly biserial. Accessory setulae variable. Prealar normally single, strong; in several species with a shorter posterior bristle. Stigmatal setulae three to 15 (absent in *atra*). Mesopleural setulae moderate, slightly stronger dorsally. Scutellum normal. Squamae subequal, the lower projecting (strongly so in European *armata*); squamae and haltere variable in color; wing clear.

Abdomen.–Normal in proportions (3 by 5) except for *armata* (2 by 3). Usually grey-pollinose, the vitta distinct and triangulated.

Legs.—Entirely black, or with knees yellowish. F_1 pvs. as a complete row of long, fine bristles. T_1 with no ad. F_2 avs. strong on basal half, usually longer than femoral width, evenly decreasing beyond the middle and doubled to form a clump of short bristles, absent on the constriction; pvs. finer, evenly decreasing to a preapical cluster, doubled on median third. T_2 variable from a strongly flattened and polished basal half and a swollen apical portion (in *lasiops*), to a scarcely differentiated form (in *ungulata*); ventral mat distinct only on apical half; medially with two to four (rarely one) ads. and pds. Mt_2 basal crest strong, quadrate to long and slender, absent only in *atra*. C_3 bare, except in *barbata* and (rarely) *ungulata* which have one or two setulae. F_3 variable from normal in shape to strongly arcuate and apically swollen; avs. from a full row of long curled bristles to a row of setulae with only three to five stronger preapicals; pvs. from a full row of long curled bristles to a row of prostrate setulae; ventrals occasionally developed. T_3 medially with one to three avs. (usually only one), one ad. *F. armata* unusual in having full rows of av., v. and pv. bristles.

Hypopygium.—Usually inconspicuous. Cercal plate more or less elongate, convex dorsally, not strongly flattened, the tip usually slightly enlarged, except in *armata* and *atra* which have only slightly elongate cercal plates. Surstylus medial, broad and simple except for a distinct inner basal process (sometimes elaborate) and in some species (related to *ungulata*) with a preapical process. In two Palaearctic species, the surstylus more or less geniculate, and apically setose. Bacilliform rod quite variable—a short broad process, an apically furcate rod, or a strong curved horn-shaped structure. Ninth sternum normal, rather broad, the aedeagus membranous. Fifth sternum much broader than long, strongly narrowed medially, the bristles sparse, short and strong.

Female

Coloration and pollinosity generally as in the male.

Head.—Eyes usually much shorter-haired than in the male. Parafrontals equal to or broader than frontal vitta, strongly convex, distinctly pollinose; setulae usually biserial. Otherwise as in the male.

Thorax.—Usually with faintly darker vittae between the bristle rows. Otherwise as in the male.

Abdomen.—Subshining black to evenly grey-pollinose.

Legs.—F_1 pvs. variable from a full row of strong bristles to (*ungulata*) only the apical half strong. F_2 with a full row of av. setulae; pvs. setulose on basal half to two-thirds, apically bare. T_2 with two ads., one to three pds. C_3 bare. F_3 with two to four strong preapical avs., basally setulose; pvs. setulose to apex (preapical stronger sometimes). T_3 with one av. (two or three in *hirticeps*), one ad.

Ovipositor.—Fairly simple, never drastically modified. Subanal plate evenly setose, weakly so medially, somewhat broader than long. Cercus normal. Eighth tergum normally simple; sternum simple, reduced to a pair of sublateral, strongly setulose plates, and a pair of basal sclerotized plates weakly connected to the anterior plates. Sixth and seventh segments simple, the anterior margins of the sterna rounded, marginal setae in a single row. Spiracles (6 and 7) normally both in the sixth tergum, occasionally the seventh spiracle in the membrane just behind the tergum. Spermathecae two smooth, spherical. Duct base curled, short to moderate in length, weakly swollen.

Larva

Not known for any of the included species.

Remarks

The biology of this group is little known, the only records of larvae are of *armata* Stein from human excrement (Bouché, 1834), and of *nidica* Collin from birds' nests (Collin, 1939). The adults have been collected in swampland and around the edge of muddy pools.

In North America the group is distributed through the Transition and Upper Austral zones. In Europe, the species of the group range from southern Scandinavia to the Mediterranean.

Fannia hirticeps (Stein)

Figs. 30, 34, 172

Homalomyia hirticeps Stein, 1892, p. 70; Stein, 1895, p. 64; Pandellé, 1899, p. 180; Wingate, 1906, p. 280; Frey, 1908, p. 119.

Fannia hirticeps, Stein, 1907a, p. 660; Ringdahl, 1912, p. 212; Stein, 1913, p. 25; Stein, 1916, p. 81; Kramer, 1917, p. 40; Karl, 1928, p. 54; Ringdahl, 1934a, p. 117; Tiensuu, 1935, p. 44; Collin, 1939, p. 141; Ringdahl, 1952, p. 156; Ringdahl, 1954a, p. 79; Hennig, 1955, p. 103.

This species is very closely related to the Nearctic *lasiops* but is separable on several minor characters, particularly the presence of a single hind-tibial anteroventral bristle, the simpler surstylus, and narrower bacilliform rod. From other species of this group it can be recognized by the distinctly hairy eyes, long mid-metatarsal spur, and complete row of long, strong, hind-femoral anteroventral bristles. Length 4.5 mm.

Male

Head.—Parafrontals silvery, almost contiguous, narrow next ocellar triangle, and strongly broadened apically (0.04 increasing to 0.16 mm.). Parafacials broad, genae at oral margin equal to distance between vibrissae. Eyes distinctly hairy. Second antennal segment with two (rarely three) strong bristles, third segment short and broad (0.30 by 0.50 mm.). Basal aristal segment large, arista thickened on basal third.

Thorax.—Dark brownish-black-pollinose. Acr. long and hair-like; accessory setulae long and fine, numerous presuturally, sparse postsuturally. Pra. one, strong. Mesopleurals numerous, not stronger dorsally. Stigmatal setulae numerous. Squamae pale yellow, margin darker. Haltere dark brown.

Abdomen.—Long and slender, 1.4 by 2.8 mm. Greyish-brown-pollinose, the dark-brown median vitta strongly triangulated, distinct.

Legs.—Black, not even the knees yellowish. F_2 avs. basally twice femoral width, decreasing evenly to a preapical comb of half femoral width. T_2 strongly flattened and forming a distinctly convex posteroventral ridge on basal half; rounded and swollen on apical half, at largest three times basal diameter; ventral mat dense; two or three ads., two or three pds. Mt_2 crest elongate, twice metatarsal diameter. F_3 somewhat arcuate and curved; avs. strong (twice femoral width), slender and curled at apex, of equal length throughout the row; ventral and pv. setulae many; bristles on posterior surface long, strong, similar to avs. T_3 with one av., one ad.

Hypopygium.—Cercal plate long and slender with a small apical "button". Surstylus simple, evenly curved and tapered to apex; inner basal process tripartite, the projections not curved. Bacilliform process strap-shaped.

Female

Head.—Parafrontals broader than frontal vitta, greyish-brown-pollinose, setulae at least biserial. Second antennal segment with one short and several stubby setae, third segment very broad (0.18 by 0.30 mm.).

Thorax.—Greyish-brown, with darker brown vittae between dc. and acr. rows. Stigmatal setulae five or six. Squamae pale yellow. Haltere yellow brown.

Abdomen.—Subshining throughout.

Legs.—Entirely black, not even knees yellow. F_1 pvs. strong to base. F_2 avs. and pvs. prostrate and setulose. T_2 with two ads., two or three pds. F_3 with four strong erect avs. on apical half. T_3 with one av., one ad.

Type locality and type

Genthin, Germany. Type in Zoologische Museum, Berlin, Germany.

Remarks

There are no records on the biology. In Europe the species is known from Scotland, Germany, Dorpat, and Hungary. In our region it is known from only one locality, Matanuska, Alaska.

Records, (Map 16)

ALASKA. Matanuska, 8 ♂♂, 36 ♀♀.

Collecting dates from April 28 to June 5.

***Fannia lasiops* Malloch**

Figs. 29, 33, 171, 235

Fannia lasiops Malloch, 1920, p. 168; Malloch, 1924a, p. 417.

This species is extremely close to *hirticeps* (see note under *hirticeps*), but is separated by the two or three hind-tibial av. bristles, and several minor genitalic characters. It is possible that this is only a Nearctic subspecies, but there is as yet no evidence of any intermediate, although this is possibly because of a large distributional gap between the forms. There does not seem to be any geographic variation in *lasiops* within the presently known range.

Male

As described for *hirticeps*, except that there are three (rarely two) T_3 avs.

Hypopygium.—Very similar to *hirticeps*, but the surstylus more arcuate, suddenly narrowed preapically, the projections of the inner basal process curved; bacilliform process broader and shorter.

Female

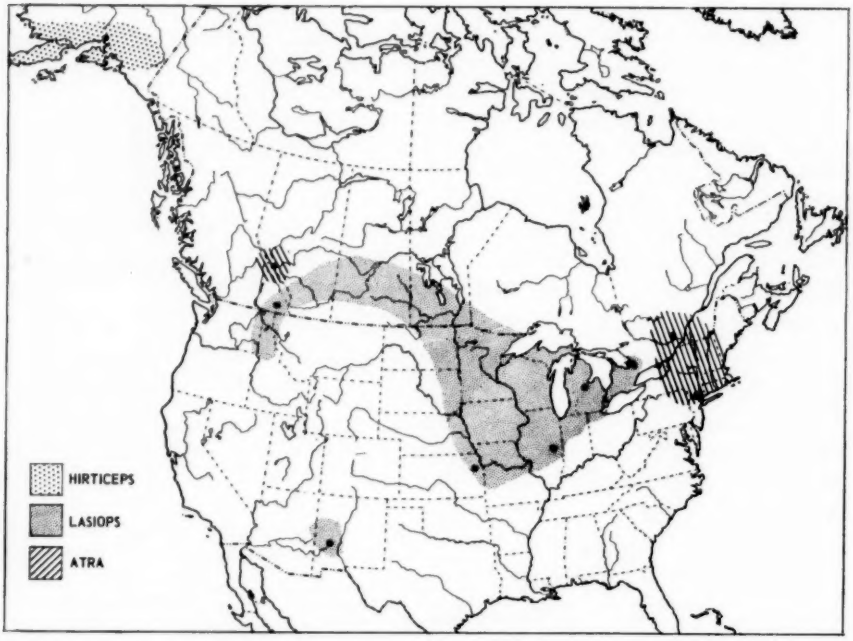
Head.—Parafrontals distinctly broader than frontal stripe (0.22 to 0.16 mm.), greyish-brown-pollinose, setulae at least biserial. Second antennal segment with two moderately long and several short thin setulae, third segment shorter (0.18 by 0.36 mm.).

Thorax and *Abdomen.*—As described for *hirticeps*.

Legs.—Entirely black. F_1 pvs. strong to base. F_2 with some of the basal setulae erect, stronger; pvs. erect on basal third. T_2 with two ads., two pds. F_3 with usually only three strong preapical avs. T_3 with two avs., one ad.

Type locality and type

Urbana, Illinois (Augerville Woods). Type in the Illinois Natural History Survey collection, examined by me in February, 1955.



Map 16. Geographic distributions of *F. hirticeps* Stein, *F. lasiops* Mall., and *F. atra* (Stein).

Remarks

The biology of this species is not known, but it has been collected by the author in some numbers on the margin of a muddy pond, along with *ungulata.*

This species is rare in collections, but appears to have the same range as *ungulata.* The nearest recorded locality to that of *hirticeps* in Alaska is Robson, British Columbia.

Records, 12 ♂♂, 16 ♀♀ (Map 16)

ILLINOIS. Urbana, 1 ♂ (Type). MICHIGAN. Saginaw Co., 1 ♂. ONTARIO. Midland, 1 ♂, 1 ♀. KANSAS. Lawrence (Nat. Hist. Res.), 8 ♂♂, 14 ♀♀. BRITISH COLUMBIA. Robson, 1 ♂. NEW MEXICO. Cloudcroft, 1 ♀.

Collecting dates from March 30 to July 26, the majority in April and May.

Fannia ungulata, new species

Figs. 31, 35, 173, 236, 264

This species has no close relatives in the Nearctic region, but is very closely related to the European *cothurnata* Loew, less closely to *nidica* Collin and *barbata* Stein, also European. It can be separated from all Nearctic species of the group by the unmodified hind femora with only three or four strong preapical anteroventral and setulose posteroventral bristles, and by the quadrate mid-metatarsal crest. From the European forms, it is separated mainly on the basis of the male genitalic structure. Length 4.5-5.0 mm.

Male

Head.—Parafrontals silvery, almost contiguous, narrow, only moderately broadened toward antennae (0.04 increasing to 0.12 mm.). Parafacials moderate in width, genae at oral margin three-fifths the distance between vibrissae. Eyes with only a few scattered hairs. Second antennal segment with a single strong bristle, third segment small (1.4 by 2.4 mm.). Basal aristal segment short, arista thickened on basal fourth.

Thorax.—Brown-pollinose. Acr. and accessory setulae short. Pra. one, strong, often with a weaker posterior bristle. Mesopleurals moderate, faintly stronger dorsad. Stigmatal setulae three to five. Squamae pale yellow. Haltere dark yellow.

Abdomen.—1.4 by 2.5 mm. Brownish-grey-pollinose, the vitta triangulated, distinct, narrower than in *hirticeps*.

Legs.—Black, the knees slightly paler. F_2 avs. basally 1.5 times femoral width, decreasing evenly to a comb of about 10 on a distinct swelling. T_2 not strongly flattened basad, at its greatest width twice basal diameter, ventral mat short (two-thirds tibial width); two ads., two pds. Mt_2 crest quadrate, as long as metatarsal diameter. F_3 normal, with only two or three strong preapical avs., setulose basad; pvs. setulose throughout. T_3 with one av., one ad.

Hypopygium.—Cercal plate broad on basal half, then tapering to a slender portion bearing apically a strikingly hoof-shaped expansion. Surstylus broad and not sharply curved, with a preapical dorsal "thumb", inner basal process broad, then tapering sharply to a slender band tipped with a crescent-shaped expansion. Bacilliform process in the shape of a cow-horn.

Female

Head.—Parafrontals evenly grey-pollinose, approximately equal to frontal vitta. Otherwise as in male.

Thorax.—Bluish-pollinose, nonvittate. Stigmatal setulae two to five. Squamae and haltere pale yellow.

Abdomen.—Evenly subshining throughout.

Legs.—Entirely black. F_1 pvs. strong on apical two-thirds, basally setulose. F_2 avs. and pvs. setulose, prostrate. T_2 with two ads., one or two pds. F_3 as in the male. T_3 with one av., one ad.

Types

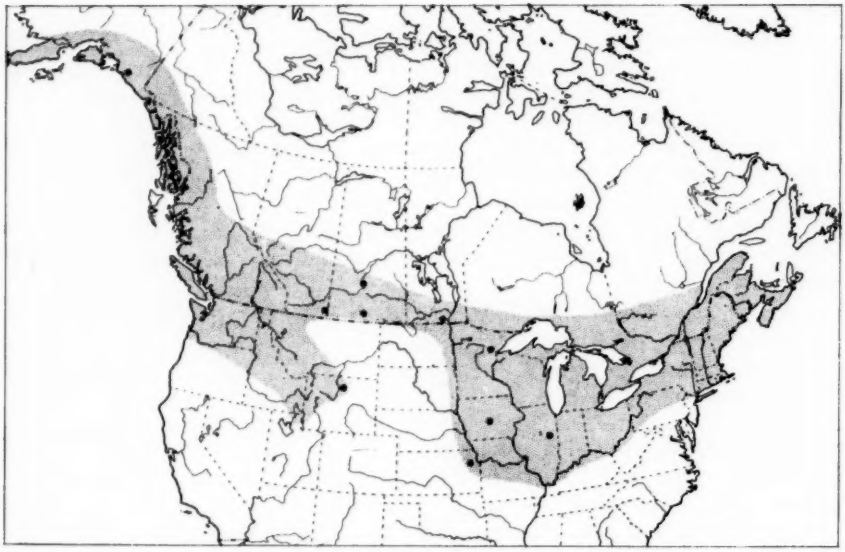
Holotype.—♂, Natural History Reservation, Lawrence, Kansas, 24.IV.1956 (J. G. Chillcott) (C.N.C. No. 6652).

Allotype.—♀, same data (C.N.C.).

Paratypes.—45 ♂♂, 43 ♀♀ as follows: KANSAS. Lawrence (J. G. Chillcott): 28 ♂♂, 18 ♀♀, same data as type; 4 ♂♂, 4 ♀♀, 30.IV.1956; 1 ♂, 4 ♀♀, 19.IV.1956; 2 ♂♂, 2 ♀♀, 25.IV.1956; 10 ♂♂, 12 ♀♀, 28.IV.1956; 1 ♀, 27.III.1957.

Additional Records, 15 ♂♂, 17 ♀♀ (Map 17)

KANSAS. Leavenworth Co., 1 ♂; Ottawa Co., 1 ♂. IOWA. Ledges State Park, 2 ♂♂; Sioux City, 1 ♀. ILLINOIS. nr. Forest City, 1 ♀. MINNESOTA. Houston Co., 2 ♀♀. WISCONSIN. Madison, 1 ♀. COLORADO. Pingree Park, 1 ♀. NORTH CAROLINA. Franklin, 1 ♀. ONTARIO. Midland, 5 ♂♂, 1 ♀. MANITOBA. Aweme, 1 ♂. SASKATCHEWAN. Saskatoon, 1 ♂; Rockglen, 2 ♀♀; Val Marie, 1 ♀. ALBERTA. Elkwater, 1 ♂, 1 ♀; Milk R., 1 ♂, 2 ♀♀; Wayne,



Map 17. Geographic distribution of *F. ungulata* Chill.

1 ♀; Cypress Hills, 1 ♀; Cypress Hills (ex carrion), 1 ♂, 1 ♀. ALASKA. Chitina, 1 ♂.

Collecting dates from May 8 to June 26.

Remarks

The biology of this species is not definitely known, but the adults have been collected in considerable numbers along the edge of a marshy pond, and additional records are from swampy deciduous forest and prairie sloughs.

***Fannia atra* (Stein)**

Figs. 32, 36

Homalomyia atra Stein, 1895, p. 125; Wingate, 1906, p. 283.
Fannia atra, Stein, 1907a, p. 657; Kramer, 1917, p. 41; Karl, 1928, p. 65; Collin, 1933, p. 121; Karl, 1937, p. 128; Hennig, 1955, p. 28, Figs. 45, 77.
Fannia femorata Malloch, 1910, p. 67 (nec Loew, 1861); syn. *teste* Collin, 1933.
Fannia carteri Malloch, 1912, p. 176 (n.n. for *femorata* Mall.).

This species is rather variable both in color and tibial bristling, and a comparison of Malloch's and Hennig's descriptions show the extremes. The North American material, though scanty, also shows considerable variation, but genitalic structure and general habitus indicate that the specimens are conspecific with the European material. Length 4.0 mm.

Male

Head.—Parafrontals silvery, brownish next ocellar triangle; contiguous; very narrow at ocellar triangle, scarcely broadened next antennae (0.03 increasing to 0.07 mm.). Parafacials narrow, genae at oral margin half the distance between vibrissae. Postoccipital bristles absent (unique in the group). Eyes bare. Second antennal segment with a single bristle, third segment small (0.15 by 0.25 mm.). Basal aristal segment normal, arista thickened on basal sixth.

Thorax.—Dark brownish-black-pollinose. Acr. and accessory setulae sparse, moderate in size. Pra. two, the anterior one stronger. Mesopleurals moderate, somewhat stronger dorsad. Stigmatal setulae absent. Haltere and squamae yellow (variable from yellow-brown to clear whitish).

Abdomen.—1.4 by 2.0 mm. Distinctly broadened, and rather sharply truncated caudad, median vitta triangulated, sometimes strongly obscured by dark brownish-grey pollen.

Legs.—Uniformly black. F_2 avs. equal to femoral width basally, evenly decreasing to a partially doubled comb at three-fourths; pvs. finer, doubled on median third. T_2 narrow, cylindrical, and polished ventrally on basal three-fifths, then enlarged to 1.5 times basal diameter; ventral mat short, distinct only on swollen portion; one or two ads., one pd. F_3 arcuate, distinctly swollen at three-fourths; avs. setulose basad, gradually increasing from one-fourth until 1.5 times femoral width at apex; pvs. setulose on basal half, then increasing until twice femoral width at four-fifths, curled and slender at their tips. T_3 with two avs., and one or two ads.

Hypopygium.—Cercal plate slender, only weakly elongate. Surstylus simple, slender; inner basal process short, quadrate, serrated ventrally. Bacilliform process small, tapering to apex with a preapical process.

Female

Head.—Parafrontals subshining black, scantily brown-pollinose, one-third broader than frontal vitta. Parafacials linear in lateral view, genae at oral margin narrow. Otherwise as in the male.

Thorax.—Subshining black, sparsely brown-pollinose, nonvittate. Squamae and haltere very pale yellow.

Abdomen.—Evenly subshining black.

Legs.—Entirely black. F_1 pvs. strong on apical two-thirds, basally setulose except for one or two strong bristles. F_2 avs. and pvs. setulose, prostrate. T_2 with two ads. and pds., the upper bristles often weak, rarely absent. F_3 with three or four strong avs. on apical third. T_3 with two or three avs., one ad.

Type locality and type

Vienna and Thuringen (restricted to Vienna, Austria). Type in "Zool. Mus. Budapest" according to Hennig (still in existence?).

Type locality of *carteri*: Aberfoyle, Scotland. Type in the collection of J. E. Collin, Newmarket, England.

Records, 3 ♂♂, 2 ♀♀ (Map 16)

BRITISH COLUMBIA. Robson, 2 ♀♀. ALBERTA. Sunwapta Pass (Banff National Park) (6700 ft.), 1 ♂. NEW YORK. Tuxedo (Sta. Study of Insects), 1 ♂. QUEBEC. Harrington Lake, Gatineau Park, 1 ♂.

Collecting dates are April 24, May 30, July 5, August 6, and August 16.

postica Group

This group is most closely related to the *hirticeps* group, less closely to the *lugubrina* group. From both, it can de identified by the single mid- and hind-tibial bristles, long preapical pvs. on F_3 (male) and narrower parafrontals in the females. There are two subgroups apparent within this group: the *postica* subgroup with from two to many F_3 anteroventral bristles, and an elongate cercal plate; and the *spathiophora* subgroup with a single F_3 av., and with a broad short

cercal plate. However, there are some species which are placed with difficulty despite the general correspondence of male genitalic characters with the above subgroupings. Of the species referable to this group, 11 are Nearctic, two are Holarctic, and three are Palaearctic. In a few species, there is a striking geographic and individual variation in color, in number and size of frontal bristles, in parafrontal width, and in development of the mid-metatarsal crest.

Male

Head.—Frontal bristles two to 14, extremely variable in both size and number. Parafrontals usually contiguous and narrow, in some species faintly separated and broadening toward antennae. Parafacials without setulae. Occipital bristles usually short and regular. Postoccipital bristles absent in all but *bigelowi*. Second antennal segment with a single strong bristle, third segment usually twice as long as broad. Arista subpubescent. Palpus linear to subspatulate, theca short, weakly pollinose, weakly to moderately sclerotized.

Thorax.—Grey to brownish-black, nonvittate, moderately pollinose. Acr. bristles strictly biserial or with a median row postsuturally. Accessory setulae usually sparse and short. Prealars two, the posterior one distinctly smaller, rarely absent. Stigmatal setulae usually absent. Mesopleural setulae variable. Scutellum normal. Squamae variable; the lower almost equal to upper and weakly projecting, or reduced (in some species almost linear) and only faintly lobate. Color of squamae, wing, and haltere from dark brown to pale yellow.

Abdomen.—Variable from one-half to two-thirds as broad as long. Grey- to brown-pollinose, median vitta triangulated, usually distinct, often much obscured in the *spathiophora* subgroup.

Legs.—Variable from entirely black to (rarely) entirely yellow (except tarsi). F_1 with a full row of pv. bristles. T_1 without median bristles except for a partial row of long fine pv. hairs in *spathiophora*. F_2 with normally differentiated bristles, long and fine basally, decreasing evenly to faintly clumped preapical comb. T_2 scarcely flattened basad (except in the *spathiophora* subgroup where there is often a distinct posteroventral ridge), broadening apically to at most 1.5 times basal diameter; ventral mat distinct only on apical half; medially with one ad., one pd. Mt_2 usually with a distinct basal crest variable from weakly quadrate to strong and thorn-like. C_3 bare. F_3 avs. variable from one to a full row; pvs. setulose basad, increasing on apical half to distinct bristles, normally from four to 12 distinct (only two distinct in *scyphocerca*). T_3 medially with one av., one ad.

Hypopygium.—Usually inconspicuous, elongate in general structure. Cercal plate distinctly elongate, variable from flat and broad to narrow and distinctly concave preapically with the tip curving outwards. Surstylus in a medial position, usually completely articulated, curved much as is the cercal plate, apically hooked, without any trace of an inner basal process. Bacilliform rod variable from faintly curved to moderately spiralled. Ninth sternum usually broad, often basally furcate, with in many species a lateral curved process (strongly spinose and sclerotized in *aethiops*). Aedeagus membranous. Fifth sternum distinctly broader than long; bristles short and strong, crowded toward posterior margin.

Female

Much less distinct than the males with only minor differences in bristling and pollinosity.

Head.—Parafrontals normal in shape, variable from evenly to sparsely pollinose; setulae uniserial. Occipital bristles strong, short, regular. Postoccipitals absent except in *bigelowi*. Antennae normal. Theca, unlike the males, glossy and swollen. Palpus in the *postica* subgroup slender, in the *spathiophora* subgroup weakly to strongly spatulate.

Thorax.—As in the male.

Abdomen.—Normally weakly pollinose, subshining black, but in a few species distinctly bluish-brown-pollinose.

Legs.—F_1 pvs. decreasing evenly to base. T_1 normal. F_2 with even setulose rows of avs. and pvs. F_3 with two or three strong preapical avs., pvs. setulose. Tibiae usually with only single medial bristles but occasional specimens with supernumary bristles, occasionally an anteroventral bristle on the mid tibiae. So far as I can determine, these extra bristles represent only individual variation, and have no specific value.

Ovipositor.—Generally simple in structure of sclerites and spermathecae, although eighth sternite with some striking characters. Subanal plate variable in proportions, generally broader than long in the *postica* subgroup and elongate and produced in the *spathiophora* subgroup, usually evenly but sparsely setulose discally. Cercus normal.

Eighth tergum normal in shape. Eighth sternum strikingly modified in several species. Typically two small sclerites with only a few setulae, as in *postica* and *bigelowi*, but the sclerites elongate in *spathiophora*, and strongly swollen and lacking in bristles in *sequoiae*. In *aethiops* a pair of irregularly shaped sclerites apicad of the normal sclerites. In *flavibasis*, there is unusual geographic variation in sclerite structure. In British Columbia most specimens have a solid sternal plate which is slightly concave discally with a projecting anterior margin. Southern specimens have the sternum reduced medially so as to approach or attain the normal condition.

The seventh segment normal with the sternum as broad as long, often with the anterior margin somewhat concave. The sixth segment similar in shape, the tergum usually containing both of the last two spiracles situated at the anterior and posterior margins, the sixth spiracle more rarely in the membrane behind the sixth tergum.

The spermathecae two in number, rather pear-shaped, somewhat elongate in *flavibasis*, corrugated weakly on the apical third, apically with a dimple, this concavity in the *postica* subgroup often with a central nipple. The duct base usually somewhat swollen, sclerotized, and strongly curved.

Larva

Known only for *postica* (see specific description).

postica subgroup

Fannia postica (Stein)

Figs. 37, 43, 174, 240

Homalomyia postica Stein, 1895, p. 89 (Anmerkung); Pandellé, 1899, p. 179; Wingate, 1906, p. 281.

Fannia postica, Stein, 1907a, p. 663; Frey, 1908, p. 119; Malloch, 1912a, p. 233; Malloch, 1913, p. 627, Fig. 7; Stein, 1913, p. 25; Stein, 1916, p. 81; Séguy, 1923, p. 273; Malloch, 1924a, p. 421; Malloch, 1924b, p. 518; Karl, 1928, p. 63; Lindroth, 1931, p. 324; Ringdahl, 1934a, p. 121; Tiensuu, 1935, p. 44; Ringdahl, 1939, p. 42; Ringdahl, 1944a, p. 17; Ringdahl, 1951, p. 167; Ringdahl, 1952, p. 158; Nielsen, Ringdahl, and Tuxen, 1954, p. 118, Fig. 31 (larva?); Ringdahl, 1954a, p. 79; Hennig, 1955, p. 72, Figs. 27, 98; Gill, 1955, p. 652; Collin, 1958, p. 92.

This species is fairly easily separated from others of the group by the full row of long hind-femoral anteroventral bristles, and the lack of a mid-metatarsal crest. According to Hennig (1955) the species is quite variable in color in Europe, and he recognized a color variety *parapostica* with blue-grey pollen and yellowish-white squamae and wings. Equally striking variations occur in North America, with most eastern specimens being strikingly dark brown-pollinose, with broad parafrontals in the northeast and narrow parafrontals in the southeast. Some eastern specimens have yellow squamae and halteres and the fore knees yellow. British Columbian and Alaskan specimens are identical with typical European material. Length 4.0-4.5 mm.

Male

Head.—Frontal bristles seven to nine, long, with a few interstitials. Parafrontals silvery, sometimes with brown pollen next ocellar triangle, narrow (0.02 increasing to 0.06 mm.). Occipital bristles long, grading into verticals. Arista distinctly pubescent. Palpus at most faintly spatulate.

Thorax.—Medium- to dark-brown-pollinose. Acr. strictly biserial. Mesopleurals sparse, slightly longer and stronger dorsad. Squamae subequal, the lower slightly projecting, brownish-yellow. Haltere brown.

Abdomen.—1.1 by 2.0 mm. Greyish-brown-pollinose, the median vitta strong, black, subtriangular.

Legs.—Black, rarely fore knees yellowish. F_2 avs. seven to nine to two-thirds, widespread and equal to femoral width basally, then gradually decreasing and changing to a short comb of seven or eight; pvs. nine or 10 to three-fourths, decreasing only slightly, followed by a short comb of five, pvs. doubled on median third ventrally. T_2 little modified, scarcely flattened basad, enlarged gradually beyond the middle to 1.5 times basal width; ventral mat equal to tibial width. Mt_2 with no basal crest. F_3 avs. with four or five strong preapicals, then weaker bristles decreasing gradually to base, at base scarcely shorter than femoral width; pvs. with six to eight long preapicals, gradually decreasing to middle, with erect setulae basad. T_3 with a few median posterior setulae erect (unique).

Hypopygium.—Cercal plate slender, elongate, strongly concave on apical half. Surstylus long, slender, upturned apically. Bacilliform process corkscrew-shaped but flattened. Ninth sternum slender, with a short outer and long inner basal process.

Female

Head.—Parafrontals sparsely pollinose, subshining, the parafacials contrastingly silvery-pollinose.

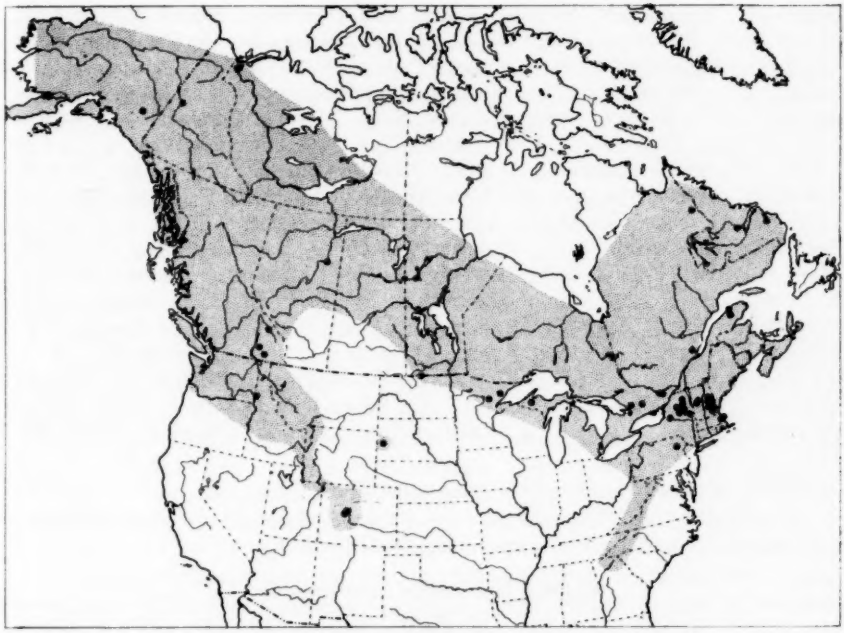
Thorax.—Lower squama narrower than upper, not projecting.

Abdomen.—Subshining black, the fifth segment usually glossy.

Legs.—Normal.

Larva

Known only from a figure and brief description by Nielsen et al., 1954, of larvae tentatively referred to this species. It is probable that the integument is very similar to those of the *lugubrina* group. Laterodorsal processes very short and weak with the lateral projections (probably) simple and extending anteriorly to near base of segments, those on caudal segment short and subequal; lateroventral processes very short and weak; dorsal processes not evident. Cephalic



Map 18. Geographic distribution of *F. postica* (Stein).

and lateral processes of first thoracic segment short but distinct (lateral process short and fleshy). Anterior spiracular processes probably very short, six to eight in number. Posterior spiracular stalk situated slightly in from margin of segment, the processes short and more or less radially arranged. Mouth hooks not described or figured.

Type locality and type

England. Type location unknown.

Remarks

Adults have been collected from decaying beef liver (Gill, 1955).

The species is known in Europe from Lapland to Finland, the Alps, British Isles through Germany, with the variety *parapostica* Hennig known from Berlin and Stolp to Pomerania (Pommern). In North America it has a similar northern distribution, occurring throughout the entire boreal forest zone. It is also known from Iceland, where it has been associated with, and larvae have been collected from under, birch scrub.

Records, 63 ♂♂, 86 ♀♀ (Map 18)

ALASKA. King Salmon, Naknek R., 24 ♂♂, 9 ♀♀; Curry, 1 ♀; on tundra, Naknek, 6 ♂♂, 6 ♀♀; Nabesna, 1 ♀. YUKON. Dawson, 4 ♀♀. NORTHWEST TERRITORIES. Aklavik, 2 ♂♂, 2 ♀♀. BRITISH COLUMBIA. Robson, 7 ♀♀; Fort Nelson, 1 ♀; Carbonate, Columbia R. (2600 ft.), 2 ♀♀; Downie Creek, Selkirk Mts., 1 ♀. ALBERTA. McMurray, 1 ♂, 2 ♀♀; Elkwater, 1 ♀. OREGON. Marksfield, 2 ♀♀. COLORADO. Tennessee Pass, 1 ♂; Spring Creek

Pass, 1 ♂. IDAHO. Mt. Moscow, 1 ♀. SASKATCHEWAN. Prince Albert, 1 ♀. MINNESOTA. Basswood Lake, Lake Co., 1 ♀; Lake Co., 2 ♂♂, 5 ♀♀; St. Louis Co., 1 ♂. WISCONSIN. Squaw Lake, Vilas Co., 1 ♀. SOUTH DAKOTA. Sylvan Lake, 1 ♂. ONTARIO. Ottawa, 1 ♂, 7 ♀♀; Blackburn, 2 ♂♂, 4 ♀♀; Maynooth, 2 ♂♂; Norway Point, Lake of Bays, 2 ♀♀. QUEBEC. Mt. Albert, 2 ♀♀; Indian House Lake, 1 ♀; Lac Phillipe, 1 ♀; Mistassini Post, 1 ♂; Cap Chat, 1 ♀; Bonne Esperance, 3 ♂♂. NEWFOUNDLAND. Sandy Lake, 3 ♀♀. LABRADOR. Goose Bay, 2 ♀♀. NEW YORK. Ashford, 1 ♀; Old Forge, 1 ♀; Lake George, 1 ♀; Fish Creek, Adirondacks, 1 ♀; Otter Lake, 3 ♀♀; White Face Mt., Adirondacks, 1 ♂; Raquette Lake, 1 ♂; Mt. Hurricane, Essex Co. (4872 ft.), 1 ♂; Huggards, St. Lawrence Co., 1 ♀. MASSACHUSETTS. Beverly, 1 ♀; Gloucester, 1 ♂. NEW HAMPSHIRE. White Mts. (Dolly Copp), 1 ♂, 1 ♀; White Mts., 2 ♂♂; Mt. Washington (Alpine Garden), 1 ♂; Benton, 1 ♀; Franconia Notch, 1 ♀; Mt. Adams (4200 ft.), 2 ♀♀, (5-5790 ft.), 1 ♂; Manchester to Peru, 1 ♂; Lost River, 1 ♂; Mt. Madison (4925 ft.), 1 ♂, 2 ♀♀. VERMONT. Mt. Mansfield (Peak), 1 ♀; Smuggler's Notch, 3 ♀♀. PENNSYLVANIA. Pocono Lake, 1 ♂. NORTH CAROLINA. Mt. Mitchell (6800 ft.), 1 ♀.

Collecting dates from June 1 to August 23.

I have also seen 12 specimens from England, Scotland, Sweden, Germany, and Austria, as well as several specimens from Iceland.

Fannia brevicauda, new species

Figs. 38, 44, 195

This species is most closely related to *postica*, with no mid-metatarsal crest, several hind-femoral anteroventrals, and only weakly elongated male surstylus and cercal plate; and is separated from that species by the triserial acrosticals, and fewer (at most five) distinct hind-femoral anteroventrals. In general appearance, many specimens could be confused with *flavibasis*, but the lack of a metatarsal crest is distinctive. Length 4.0-4.6 mm.

This species is even more variable than *flavibasis* in coloration and head structure, so that the extremes of variation are so striking as to appear to be distinct species. However, there appears to be complete intergradation in all differentiating characters, and both extremes can be found in a single locality, so that they must be considered parts of a single taxon. Length 4.0-4.5 mm.

Male

Head.—Frontal bristles variable from two to eight; when six to eight the bristles long and slender; but when two to four the bristles shorter and thicker. Parafrontals silvery, variable from almost linear (0.03 mm.) to distinctly broader apically (up to 0.1 mm. at antennae). Occipital bristles short and regular. Arista subpubescent. Palpus filiform, not expanded apically.

Thorax.—Distinctly brown- to greyish-brown-pollinose. Acr. triserial postsuturally. Posterior pra. often weak, sometimes absent. Mesopleurals moderate, slightly stronger dorsad. Lower squama reduced, not extending beyond upper. Squamae and haltere variable from medium brown to pale yellowish-white.

Abdomen.—1.1 by 2.0 mm. Grey- to dark-brown-pollinose, the median vitta usually distinct and triangulated.

Legs.—Dark brown to black, tibiae entirely black to reddish with all knees yellowed. Mid legs bristled as described for *postica*. F_3 avs. with four or five strong preapicals, the basal two or three weaker, erect to prostrate setulae basad;

pvs. variable, usually eight to 12 preapicals as long as preapical avs., decreasing to erect setulae on basal fourth.

Hypopygium.—Cercal plate rather short and broad, preapically concave. Surstylus slender with basal portion moderately broadened. Bacilliform process slender, weakly spiralled. Ninth sternum very slender with the bases bifurcate.

Female

Apparently identical with *flavibasis*, somewhat smaller and darker.

Types

Holotype.— ♂, Bishop, California, 28.VII.1940 (D. E. Hardy). (Snow Entomological Museum).

Allotype.— ♀, same data. (Snow Entomological Museum).

Paratypes.— 11 ♂♂, 4 ♀♀, as follows: CALIFORNIA. 2 ♂♂, same data (L. J. Lipovsky); 1 ♂, Mono Lake, 31.VII.1940 (D. E. Hardy); 1 ♂, Lone Pine, 28.VII.1940 (D. E. Hardy). WYOMING. 1 ♂, 3 ♀♀, Old Faithful, Yellowstone Park, 12.VIII.1927 (J. M. Aldrich); 1 ♀, same locality, 5.VIII.1921 (F. M. Sallee). WASHINGTON. 1 ♂, Medical Lake, 14.VII.1920 (R. C. Shannon). MONTANA. 1 ♂, Bozeman, 2.VII.1913 (no collector); 1 ♂, 1 ♀, Big Timber, 14.VII.1917 (H. G. Dyar). ALBERTA. 1 ♂, Lethbridge, 8.VII.1923 (H. E. Gray); 2 ♂♂, Lethbridge, 5, 6.VII.1956 (O. Peck).

The type and paratype material has been chosen from light-colored specimens with broad parafrontals and reduced frontal bristles because of the possibility that there may be two species involved.

Additional Records, 9 ♂♂, 2 ♀♀ (Map 19)

BRITISH COLUMBIA. Robson, 1 ♂. ALBERTA. Banff, 1 ♂. MONTANA. Bozeman (Mont. Expt. Sta.), 1 ♂. WYOMING. Old Faithful, Yellowstone Park, 1 ♂, 1 ♀. UTAH. Elk Park Creek, 1 ♂. NEVADA. Reno, 2 ♂♂, 1 ♀. CALIFORNIA. Owens R., 1 ♂; Victorville, 1 ♂.

Collecting dates from July 3 to September 1.

Fannia enigmata, new species

Figs. 40, 45

This species is very close to *postica*, and is distinguished from it mainly on the basis of male genitalic structure. In addition, the hind-femoral anteroventrals are only four in number, and the acrosticals are triserial postsuturally. From the dark extreme of *brevicauda* it is separable only by male genitalic structure. Length 4.5 mm.

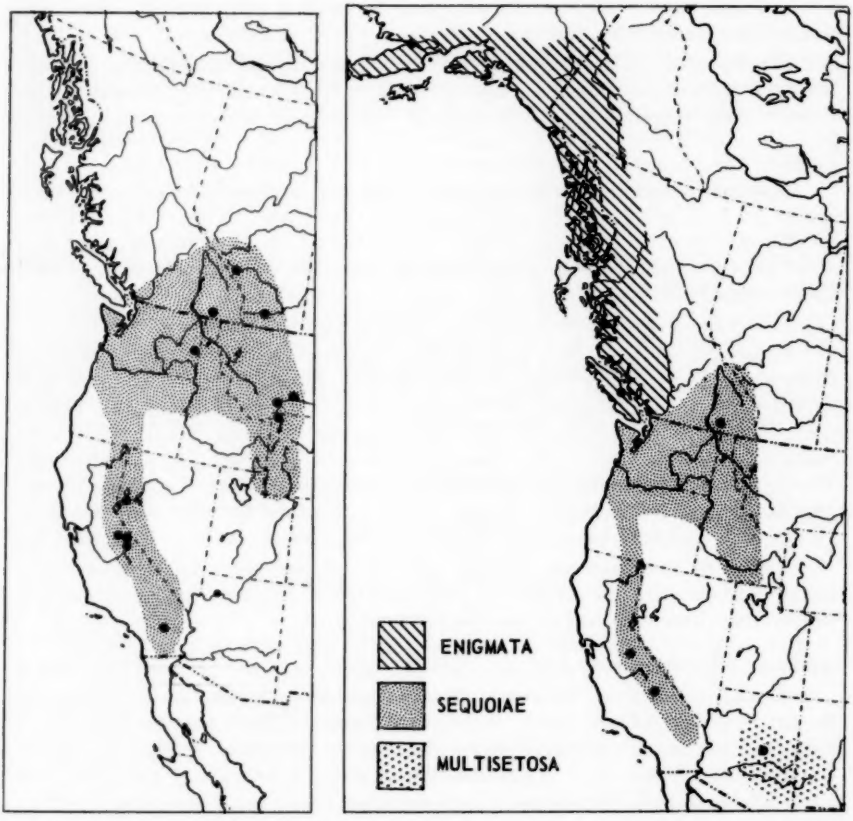
Male

Head.—As described for *postica*.

Thorax.—Dark-brown-pollinose. Acr. triserial postsuturally. Mesopleurals sparse with a distinctly stronger dorsal row. Squamae subequal, the lower slightly projecting. Squamae and haltere yellowish-brown to dark-brown, the wing membrane infuscated.

Abdomen.—1.1 by 2.0 mm. Greyish-brown- to dark-brown-pollinose, the median vitta distinct (obscured in dark specimens) and triangulated.

Legs.—Fore and mid legs apparently as described for *postica*. F_3 avs. setulose except for two to four strong preapical bristles; pvs. with six to eight strong on apical half, basally decreasing to suberect setulae.



Maps 19-20. Geographic distributions of *Fannia* spp. 19, *brevicauda* Chill. 20, *enigmata* Chill., *sequoiae* Chill., and *multisetosa* Chill.

Hypopygium.—Cercal plate distinctly broadened medially, then irregularly tapering to a broad apex, weakly concave preapically. Surstylus rather broad basally, tapering on apical half, tip curved upwards. Bacilliform process strongly spiralled. Ninth sternum very similar to that of *postica*.

Female

Not distinguishable from dark females of *brevicauda* and *flavibasis*.

Types

Holotype.— ♂, King Salmon, Naknek R., Alaska, 4.VII.1952 (J. B. Hartley) (C.N.C. No. 6654).

Paratype.—2 ♂♂, 1 ♀, Deep Bay, Bowser, British Columbia, 16.VI.1955 (R. Coyles). (Map 20).

***Fannia multisetosa*, new species**

Figs. 39, 46

This species is very close to *postica*, but the mid metatarsus bears a distinct crest, and the hind-femoral av. and pv. bristles are very long and curled at the tips. Length 4.5 mm.

Male

Head.–Frontal bristles five or six, moderate in length, scarcely shorter toward ocelli. Parafrontals silvery, narrow (0.03-0.06 mm.). Occipital bristles long, grading into verticals. Arista distinctly pubescent. Palpus linear.

Thorax.–Greased in type specimen, apparently identical to *postica.* Squamae yellowish-brown, haltere yellow.

Abdomen.–1.2 by 2.2 mm. Brownish-grey, the median vitta largely obscured on posterior segments. Hypopygium somewhat larger than normal.

Legs.–Black, all knees and much of tibiae yellowish. F_2 as described for *postica,* but with a distinct break in the pv. row between the long basal bristles and the preapical comb. T_2 as described for *postica,* Mt_2 with a distinct basal crest. F_3 rather distinctly swollen at two-thirds; avs. six, very long and fine on apical half, the row tending slightly dorsally basad, vs. erect and long on apical two-thirds; pvs. equally long, in a double row on apical half, the row trending onto posterior surface basad.

Hypopygium.–Cercal plate evenly expanded medially, tapering to a pointed apex, only slightly concave preapically. Surstylus long, slender, evenly curved upwards at apex. Bacilliform process long, slender, very faintly spiralled. Ninth sternum slender, bases elongate and bifurcate.

Female

Unknown.

Type

Holotype.– ♂, Arizona, August. No further data. (C.N.C. No. 6655) (Map 20).

Fannia flavibasis (Stein)

Figs. 41, 48, 177, 178, 241

Homalomyia flavibasis Stein, 1897, p. 171; Coquillett, 1900, p. 447.
Fannia flavibasis, Stein, 1918, p. 44; Malloch, 1924a, p. 417.
Fannia minuta Stein, 1918, p. 44; Malloch, 1924a, p. 423 (provisional name).
Fannia flavitibia Stein, 1920, p. 42 (new synonymy).

This species is quite variable in coloration, with the British Columbia material very dark-pollinose with black legs, the California material pale grey-pollinose with brownish to reddish legs, and the Utah material mainly pale with clear-yellow legs. The British Columbia specimens also differ in female genitalic structure from the more southern material. However the presence of numerous intermediates between these main types and the lack of sharp breaks in the clines indicate the essential unity of the species, and I do not propose to name the color segregates.

The species may be separated from others of the group by the presence of two (very rarely one or three) hind-femoral anteroventrals, and the small hypopygium. The only close relative is *sequoiae,* but the swollen hypopygium and glossy, swollen, female eighth sternites in that species are distinctive. Length 4.5 mm.

Male

Head.–Frontal bristles five to 10 (five in type), long and strong, with few interstitials. Parafrontals entirely silvery (type) to entirely brown, evenly narrow (0.03 increasing to 0.05) or apically broadened (type) (up to 0.10 mm.),

contiguous dorsally. Occipital bristles short, regular. Arista subpubescent. Palpus linear, not expanded apically.

Thorax.—Greyish-brown- (type) to dark-brown-pollinose. Acr. biserial, rarely a few median bristles postsuturally. Mesopleurals moderate, scarcely stronger dorsad. Lower squama only slightly projecting, subequal to upper. Squamae, haltere, and basal area of wing dark brown to pale yellow (type), the dark specimens mainly from British Columbia.

Abdomen.—1.3 by 2.0 mm. Dark-brown-pollinose with median vitta largely obscured, to pale-brownish-grey-pollinose with vitta distinct and strongly triangulated (type).

Legs.—Entirely black, with at most the fore knees yellow, to yellow with only the tarsi black (femora dark brown, tibiae yellow-brown in type). F_2 avs. eight to 10 strong on basal two-thirds, evenly decreasing to the partially doubled preapical comb of seven to 12 bristles; pvs. with the basal not distinct, nine or 10 on basal two-thirds, strongly duplicated ventrally, and a weakly clumped preapical comb of six or seven. T_2 little modified, scarcely flattened basad, enlarged gradually on the apical half to 1.5 times basal diameter; ventral mat half tibial diameter. Mt_2 crest strong, broad, only moderately consolidated. F_3 with two (rarely one or three) strong preapical avs., basally setulose; pvs. with from six to 12 bristles preapically, grading fairly evenly into setulae on basal half.

Hypopygium.—Cercal plate very elongate, slender, apically concave. Surstylus long, slender, apically curved. Bacilliform process broadened, weakly spiralled. Ninth sternum slender, the bases elongate, the laterobasal processes very weak.

Female

The females are scarcely distinct from those of *sequoiae* and *brevicauda* on external characters.

Parafrontals evenly pollinose, not subshining, the parafacials concolorous. Lower squama not projecting, distinctly smaller than the upper. Abdomen usually distinctly grey-pollinose, subshining in northern specimens. Legs colored as in the male.

Type locality and type

Illinois. Data on holotype: Algonquin, Illinois, 12.VIII.1895 (G. M. Hough). This locality record is well outside the typical range of the species, but the validity of the record is attested to by a Michigan and a Wisconsin record. Holotype in Hough Collection, Chicago Natural History Museum, Chicago, Illinois.

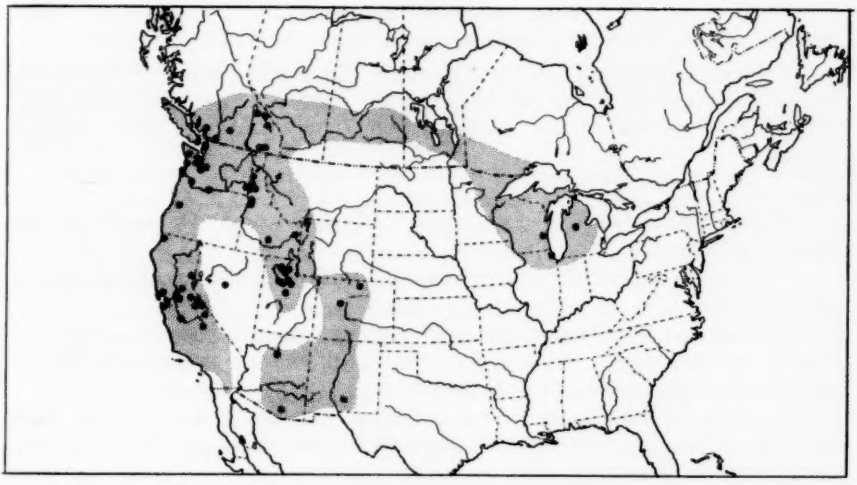
Type locality of *flavitibia*: Moscow Mt., Idaho. Type specimens (two) and five other specimens, all from Idaho, in the Zoologisches Museum, Berlin, Germany.

Remarks

These adults have been collected from celery and parsnip flowers, and one was collected from a wood-rat nest.

Records, 155 ♂♂, 298 ♀♀ (Map 21)

British Columbia. Robson, 19 ♂♂, 112 ♀♀; Brilliam, 2 ♂♂, 6 ♀♀; Ainsworth, 1 ♂; Kleanza Creek, nr. Terrace, 1 ♀; St. Mary's, 2 ♂♂, 2 ♀♀; Squamish (5300 ft.), 1 ♂, 1 ♀, (3200 ft.) 1 ♀, (4600 ft.) 1 ♀; Merritt, 1 ♂,



Map 21. Geographic distribution of *F. flavibasis* (Stein).

1 ♀; Victoria, 1 ♂; Mission City, 1 ♂; Mt. Revelstoke (5400 ft.), 7 ♀♀; Eva Lake trail (6000 ft.), Mt. Revelstoke National Park, 4 ♀♀; Mt. Harry (6200 ft.), 2 ♀♀; Atlin (2200 ft.), 1 ♀; Fairmont, 1 ♀. WASHINGTON. Fort Lewis, Pierce Co., 3 ♂♂; Friday Harbor, 7 ♂♂, 4 ♀♀; Seattle, 7 ♂♂, 11 ♀♀; Pullman, 1 ♂, 10 ♀♀; Ilwaco, 2 ♂♂, 2 ♀♀; Seaview, 1 ♂; Copalis, 1 ♂; Orcus I., 1 ♂; Tenino, 1 ♂; Doe Bay, 1 ♂; Kalama R., 1 ♂; Tacoma, 1 ♂; Keyport, 2 ♂♂; Pt. Gamble, 1 ♂; Vashon, 1 ♂; Mt. Rainier, 7 ♂♂, 1 ♀; Quinault, 1 ♀. MONTANA. Missoula, 3 ♂♂, 3 ♀♀; Vernon, 32 ♂♂, 3 ♀♀; Bozeman, 2 ♂♂. OREGON. Corvallis (ex wood-rat nest), 1 ♂; Hood R., 1 ♂; Marshfield, 1 ♂; Kelsey Valley, Douglas Co. (4100 ft.), 1 ♀; Hat Point, 1 ♂, 1 ♀; Kiger's I., 1 ♂. IDAHO. Bovil, 1 ♂, 1 ♀; Viola, 2 ♂♂, 1 ♀; Carey, 1 ♂; Moscow (on parsnip flowers), 1 ♂, 1 ♀; Victor, 1 ♂; Moscow Mt., 3 ♂♂, 5 ♀♀; Cub River Canyon, 1 ♂; Chatcolet, 8 ♀♀; Lake Waha, 1 ♀. WYOMING. Yellowstone Park, 1 ♂. CALIFORNIA. Echo, 2 ♂♂, 1 ♀; Yosemite Nat. Park, 4 ♂♂, 4 ♀♀; Mono Lake, 2 ♂♂; Leavitt Meadow, Mono Co., 1 ♀; Lake Tahoe, 1 ♂, 2 ♀♀; Smith R., 1 ♂; Memorial Park, San Mateo Co., 1 ♂; Albany, 1 ♂, 1 ♀; Lone Pine, 1 ♂, 6 ♀♀; Sequoia Nat. Park, 1 ♂, 2 ♀♀; Twinn Bridges, El Dorado Co., 1 ♂; Bishop, 1 ♂, 1 ♀; El Sobrante, Contra Costa Co., 1 ♀; Humboldt Co., 1 ♂; Muir Woods, 1 ♀; Berkeley, 3 ♀♀; Inverness, Marin Co., 1 ♀; Cuyamaca Mts., San Diego Co., 1 ♂; Clio Plumas Co., 1 ♂, 1 ♀; Madera Co., 1 ♀; Calaveras Co., 1 ♀. NEVADA. Austin, 1 ♂. ARIZONA. Chiricahua Mts., 2 ♀♀; Grand Canyon Nat. Park, 18 ♀♀. UTAH. Emigration Canyon, 1 ♂; Aspen Grove, nr. Timpanogas, 2 ♀♀; Cumming's Canyon, 2 ♀♀; Provo Canyon, 9 ♂♂, 18 ♀♀; Logan, 2 ♂♂, 10 ♀♀; Garden City, 1 ♀; Hopper, 1 ♀; Lakota, 1 ♀; Salt Lake City, 2 ♂♂, 2 ♀♀; Hunter, 2 ♀♀; Farmington, 4 ♀♀; Murray (on celery), 1 ♀; Corinne (on celery), 2 ♀♀; Midvale, 1 ♀. COLORADO. Tennessee Pass (10424 ft.), 2 ♀♀; Fort Collins, 1 ♀. NEW MEXICO. Cloudcroft, 4 ♀♀. WISCONSIN. Cedar Lake, Washington Co., 1 ♂. MICHIGAN. Mecosta Co., 1 ♂. MINNESOTA. Big Lake, 2 ♀♀.

Collecting dates from June 13 to September 27.

Fannia sequoiae, new species

Figs. 42, 47, 176, 242

This species is closely related to *flavibasis*, but is easily distinguished from it and all other species of the *postica* group by the broad and conspicuous male hypopygium and the swollen, nodose eighth sternum in the female. Length 4.5 mm.

Male

Head.—Frontal bristles five to seven, long and strong. Otherwise as described for *flavibasis*.

Thorax.—As described for *flavibasis*, the squamae faintly brownish, margin yellow-brown.

Abdomen.—1.3 by 2.0 mm. Brownish-pollinose, the triangulated median vitta evident, laterally vague. Hypopygium broad, half as wide as maximum abdominal width (only one-third of abdominal width in others of the group).

Legs.—Black, only the fore knees yellowish. Bristled as described for *flavibasis*, except for the following: F_2 preapical combs simple and uniserial. Mt_2 crest somewhat weaker.

Hypopygium.—Cercal plate and surstylus similar to those of *flavibasis*, but cercal plate broader. Bacilliform process short, strap-shaped, not spiralled. Ninth sternum broad, strongly so basad.

Female

Almost identical to *flavibasis* in bristling and coloration, although less pollinose, more subshining than typical females of *flavibasis*. It can be recognized only by the structure of the eighth sternite which is weakly developed and setulose in *flavibasis*, but strongly developed into a pair of swollen, glossy nodes in *sequoiae*.

Types

Holotype.— ♂, Sequoia National Park, California, 6.VIII.1940 (L. C. Kuitert) (Snow Entomological Museum).

Allotype.— ♀, same data (Snow Entomological Museum).

Paratypes.—11 ♂♂, 8 ♀♀ as follows: CALIFORNIA. 6 ♂♂, 6 ♀♀, same data and locality (D. E. Hardy); 3 ♂♂, 2 ♀♀, same data and locality (L. J. Lipovsky); 1 ♂, Yosemite Nat. Park, 1.VIII.1940 (D. E. Hardy). BRITISH COLUMBIA. 1 ♂, Robson, 30.VII.1947 (H. R. Foxlee) (Map 20).

spathiophora subgroup

Fannia spathiophora Malloch

Figs. 49, 55, 179, 246

Fannia spathiophora Malloch, 1918, p. 293; Malloch, 1924b, p. 517; Gill, 1955, p. 652.
Fannia nodulosa Ringdahl, 1926, p. 105; Ringdahl, 1934, p. 117, Figs. 6, 7; Tiensuu, 1938, p. 30; Karl, 1943, p. 75; Ringdahl, 1951, p. 167; Ringdahl, 1952, p. 156; Ringdahl, 1954a, p. 76; Hennig, 1955, p. 67, Figs. 28, 97 (new synonymy).

This species was described from the female in North America, and from the male in Europe, with the other sex unknown in both areas. However, extensive collections in the northern areas of North America have definitely associated the two sexes, and established the above synonymy.

The male is easily separated from related forms by the row of long pv. hairs on T_1, and the distinctly basally crested T_2; the female by the strongly spatulate palpi and short, swollen, and completely glossy theca. Length 4.0-4.5 mm.

Male

Head.—Frontal bristles about seven, ceasing well before ocellar triangle. Parafrontals narrow (0.03-0.04 mm.), silvery- or (in northern specimens) brownish-pollinose next ocellar triangle. Occipital bristles short, regular. Third antennal segment short, width three-fifths of length (unique). Arista subpubescent. Palpus only weakly spatulate.

Thorax.—Dark brownish-pollinose. Acr. biserial, strong, with a few median bristles postsuturally. Mesopleurals moderate, long ventrally, shorter and stronger dorsally. Squamae subequal, pale yellow with darker margin in eastern specimens, brownish-black in European and Alaskan specimens. Haltere similarly variable from dark yellow to brownish-black.

Abdomen.—1.2 by 2.4 mm. Bluish-grey-pollinose, the median vitta largely obscured and vaguely linear in the east; brownish-pollinose, the vitta distinct and triangular in Europe and Alaska.

Legs.—Black, knees distinctly yellowish in eastern material. T_1 with six long, fine pvs. on apical half (unique). F_2 avs. six long (1.5 times femoral width), widely spaced on basal half, then three shorter, and about eight in a doubled comb; pvs. with a strong, spine-like basal, then finer bristles slightly longer than avs., on basal two-thirds, with a clump of six to eight bristles at three-fourths from base. T_2 flattened basally with a basal posteroventral ridge changing to a ventral ridge on basal half; apically only slightly enlarged; ventral mat two-thirds as long as tibial diameter; one ad., one small pd.; ventral and anterior apicals strong with six to eight long apical ventral hairs. Mt_2 crest long, fine, and conical, as long as tibial diameter. F_3 avs. with one strong preapical, prostrate setulae basad; pvs. with fine suberect setulae on basal half, then seven longer, stronger bristles to apex (at greatest as long as femoral diameter).

Hypopygium.—Cercal plate constricted basally, then strongly broadened and tapering rather irregularly to apex, not distinctly concave. Surstylus simple. Bacilliform process long and slender, weakly curved. Ninth sternum slender with a broad lateral process.

Female

Head.—Parafrontals distinctly grey-brown-pollinose, not contrasting with parafacials. Palpus strongly spatulate, almost half as broad as long (unique).

Thorax.—Lower squama scarcely projecting, somewhat narrower than upper.

Abdomen.—Greyish-brown-pollinose, weakly subshining.

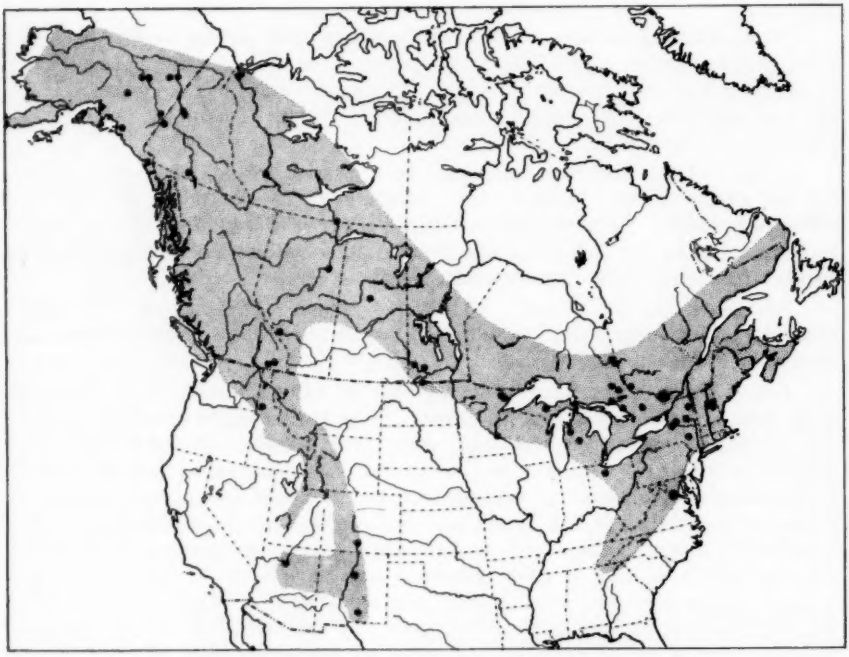
Type locality and type

Gold Rock, Ontario. Type of *spathiophora* in the Illinois Natural History Survey collection.

Type locality of *nodulosa*: Schönen. Type in collection of Ringdahl, Hälsingborg, Sweden.

Remarks

This species, as *nodulosa*, has been known in Europe from Sweden, Finland, and Germany, and in this country, as *spathiophora*, from north-central Ontario to Mexico. It is now known to range widely through the boreal region (and outlying boreal-zone localities) in North America, and is probably completely circumpolar in distribution. In the North American collections the males are rare, the females more common and often collected in long series without any males.



Map 22. Geographic distribution of *F. spathiophora* Mall.

There is unusual geographic variation in sex ratios. In the northwest, the ratio is approximately 1:10, gradually changing to 1:100 in the east. Although this may in part be due to collecting methods, the correlation of this data with the paucity of European females suggests a possible cline in sex ratio across the Holarctic region. Field studies and rearings will be necessary to confirm this.

There are several tentative biological associations indicated in the material before me. The specimens from Thornton's Gap, Va., are marked "nr. nest of *Formica pallidifulva nitidiventris* Emery". The series from Bell's Corners, Ont. is marked "swept from *Sedum*", and series from Beech Grove, Que. "swept from beaver grass". They have been collected on "entrails of hare" (Gill, 1955) and on marten dung.

Records, 24 ♂♂, 733 ♀♀ (Map 22)

ALASKA. Fairbanks, 2 ♂♂, 19 ♀♀; Fox, 2 ♂♂, 22 ♀♀; Anchorage, 2 ♂♂, 24 ♀♀; Circle (6 mi. S.), 1 ♂, 3 ♀♀; Central, 5 ♀♀; Minchumina, 1 ♀; Kussilof, 1 ♀; Tok, 1 ♀; Palmer, 2 ♀♀; Mt. McKinley National Park, 1 ♀; Mile 18.5 Richardson Hwy., 6 ♀♀; Mile 290 Richardson Hwy., 1 ♂. YUKON. Dawson, 1 ♂, 12 ♀♀; Snag, 1 ♂; King Solomon's Dome, 2 ♀♀; Mile 1221.5 Alcan Hwy., 3 ♀♀; Rampart House, 1 ♀. NORTHWEST TERRITORIES. Aklavik, 1 ♀; Fort Smith, 1 ♀; Fort Wrigley, 1 ♀; Ft. McPherson, 2 ♀♀. ALBERTA. McMurray, 6 ♂♂, 88 ♀♀; Banff, 1 ♀; Fitzgerald, 1 ♀. BRITISH COLUMBIA. Robson, 2 ♀♀; St. Mary's, 1 ♀; Keremeos, 1 ♀; Cultus Lake, 1 ♀. SASKATCHEWAN. Waskesiu Lake, 1 ♂. MANITOBA. Birtle, 1 ♀. IDAHO. Laird Park, nr. Harvard, 2 ♀♀. COLORADO. Cuchara (8000 ft.), 3 ♀♀; Lindland, 1 ♀.

NEW MEXICO. Cloudcroft, 2 ♀♀; Jemez Springs, 3 ♀♀; Beulah (paratype), 1 ♀. ARIZONA. Grand Canyon Natl. Pk., 3 ♀♀. MINNESOTA. Finland, 15 ♀♀; Itasca Park, 1 ♀; Basswood Lake, Lake Co., 1 ♀. MICHIGAN. Alger Co., 2 ♀♀; Midland Co., 1 ♀; Missaukee Co., 1 ♀. ONTARIO. Lake Abitibi, 215 ♀♀; Timagami, 2 ♀♀; Waubamie, 1 ♀; Sault Ste. Marie, 2 ♀♀; Algonquin Park, 1 ♀; Bell's Corners (Ottawa), 21 ♀♀; Blackburn (Ottawa), 1 ♀; Ottawa, 1 ♀; Maynooth, 27 ♀♀; Westree, 1 ♀; Sand Lake, 1 ♂, 9 ♀♀; Niagara Glen, 4 ♀♀. QUEBEC. Old Chelsea, 1 ♀; Beech Grove, 44 ♀♀; Laniel, 57 ♀♀; Wakefield, 1 ♂; Sully, 1 ♀. VERMONT. Smugglers Notch, 1 ♂; Mt. Equinox, 2 ♀♀; nr. West Rupert, 1 ♀. NEW HAMPSHIRE. Gorham, 1 ♀; Halfway House to Gorham, 1 ♀; Noxen Camp, 4 ♀♀; Walker Br., 5 ♀♀; Mt. Adams, 2 ♀♀; Clay Brooks (White Mts.), 1 ♀; White Mts., 1 ♀. NEW YORK. Mt. Marcy, 17 ♀♀; Raquette Lake, 21 ♀♀; Wilmington Notch, Adirondacks, 1 ♂, 2 ♀♀; Otter Lake, 2 ♀♀; Catskill Mts., 6 ♀♀, 1 intersex; Speculator, 6 ♀♀; Wells, 3 ♀♀; Elm Lake, 1 ♀; Dug Mt., 1 ♀. PENNSYLVANIA. Pavia, 2 ♀♀. OHIO. Lucas Co., 2 ♀♀. VIRGINIA. Thornton's Gap, Skyland Drive, 3 ♂♂; Skyland, Page Co., 21 ♀♀. NORTH CAROLINA. (Cornell U. Lot 35), 1 ♀; Forney Ridge (G.S.M.N.P.), 1 ♀; Clingman's Dome (6300-6642 ft.) (G.S.M.N.P.), 1 ♀.

Collecting dates from June 10 to August 16.

I have seen European specimens from Abisko, Sweden; 1 ♂, 1 ♀.

Fannia bigelowi, new species

Figs. 50, 56, 180, 244

This species belongs to the *spathiophora* subgroup, but can be separated from related species by the presence of stigmatal and postoccipital setulae. It is closest to *spathiophora* in most characters. Length 4.5-5.0 mm.

Male

Head.—Frontal bristles eight, strong, extending almost to ocellar triangle, with several interstitials. Parafrontals narrow (0.04 increasing to 0.06 mm.), silvery. Occipital bristles short, regular. Postoccipital bristles present as a partial row (unique). Arista subpubescent, distinctly thickened basally. Palpus weakly spatulate.

Thorax.—Dark-brownish-pollinose. Acr. triserial, at least postsuturally. Accessory setulae many, long and slender (unique). Mesopleurals long, numerous. Stigmatal setulae six to eight (unique). Lower squama slightly smaller than upper, both pale yellow. Knob of haltere dark brown. Wing veins brown.

Abdomen.—1.4 by 2.6 mm. Distinctly brownish-grey-pollinose, the median vitta broad and triangular, quite vague laterally.

Legs.—Black, at most the knees yellowish. F_2 avs. numerous, seven to nine long well-spaced on basal half, then eight to 10 shorter, and a preapical comb of 10 to 12; pvs. with basal distinct, then a row of bristles (finer than avs.) on basal two-thirds, and a distinct preapical clump. T_2 strongly flattened to form a posteroventral ridge on basal third, moderately swollen on apical two-thirds to twice basal diameter; ventral mat rather loose, shorter than tibial diameter. Mt_2 (Fig. 244) with basal thorn rather crescentic, not strongly projecting ventrally. F_3 avs. with one strong preapical bristle, setulose basad; pvs. setulose on basal third, then strengthening to 14 distinct bristles, apically 1.5 times femoral diameter.

Hypopygium.—Cercal plate very broad throughout, flat, apically weakly concave. Surstylus rather broad, apically upturned. Bacilliform process basally broad, then sharply curved, not spiralled. Ninth sternum moderately broad with a long slender lateral process.

Female

Head.—Parafrontals grey-brown-pollinose, not contrasting with parafacials. Postoccipital row partial. Palpus weakly spatulate.

Thorax.—Acr. triserial, usually with median setulae presuturally. At least two stigmatal setulae present. Lower squama smaller than upper.

Abdomen.—Greyish-brown-pollinose, weakly subshining.

Types

Holotype.—♂, Salmita Mines (64°05′N, 111°15′W), Northwest Territories, 4.VII.1953 (J. G. Chillcott) (C.N.C. No. 6657).

Allotype.—♀, Muskox Lake (64°45′N, 108°10′W), Northwest Territories, 20.VII.1953 (J. G. Chillcott) (C.N.C.).

Paratypes.—1 ♂, same data as holotype; 1 ♂, Padley, Northwest Territories, 24.VII.1950 (R. E. Duckworth); 1 ♂, Anchorage, Alaska, 26.VI.1951 (R. S. Bigelow) (Map 23).

Fannia tundrarum, new species

Figs. 51, 57, 243

This species is a member of the *spathiophora* subgroup and probably most closely related to *bigelowi*. On the basis of external characters, this species would key to *umbrosa*, but the genitalic structure is quite different. The dark wings and black knob of the halteres combined with the pale squamae and an even row of about ten posteroventrals on the hind femur will serve to distinguish this species from others of the group. Length 4.5 mm.

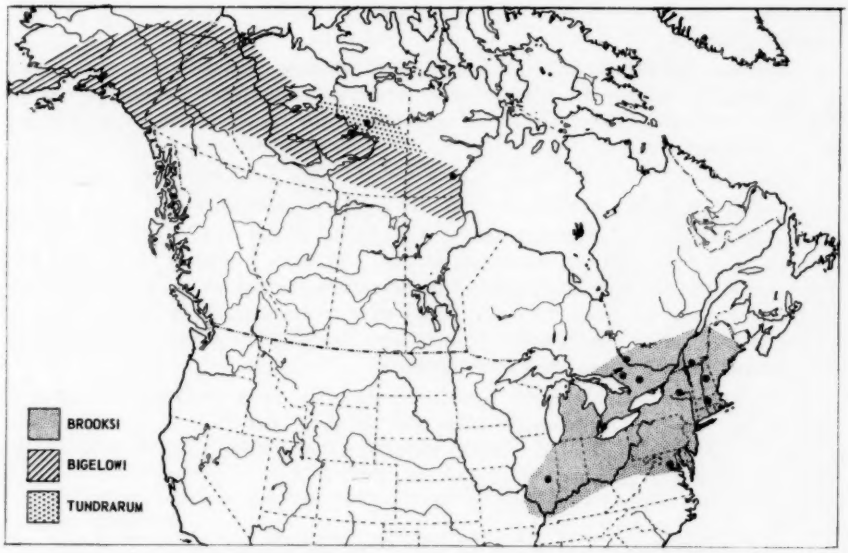
Male

Head.—Frontal bristles seven, strong. Parafrontals silvery, rather broad (0.04 increasing to 0.09 mm.), scarcely contiguous dorsally. Occipital bristles short and regular. Arista subpubescent. Palpus distinctly subspatulate, rather short.

Thorax.—Dark-brownish-pollinose. Acr. evenly biserial or weakly triserial postsuturally. Mesopleurals with dorsal row slightly stronger. Squamae pale yellow, subequal, the lower slightly projecting. Haltere with knob dark brownish.

Abdomen.—Strongly greased so that characters of the pollinosity are not apparent, 1.1 by 2.0 mm.

Legs.—Black, not even the knees yellow. F_2 with 11 strong on basal two-thirds, twice as long as femoral diameter basally, becoming shorter and closer-set apically, changing fairly sharply to a short and partially doubled comb of about 12, a distinct break on narrow portion, and a few preapical setulae; pvs. equally long on basal two-thirds, strongest medially, a break, and a long (1.5 times femoral diameter) clump of about five at three-quarters, another break on constricted portion, and the usual preapical setulae; ventral row present on basal two-thirds, the bristles fine and about equal to femoral diameter. T_2 distinctly flattened on basal half with posteroventral ridge fairly well developed, apically increasing to 1.5 times basal diameter. Ventral mat a little shorter than tibial



Map 23. Geographic distributions of *F. brooksi* Chill., *F. bigelowi* Chill., and *F tundrarum* Chill.

diameter. Mt_2 crest slightly longer than broad, triangular in shape. F_3 avs. with one strong preapical, with prostrate setulae basally; pvs. with about 10 strong on apical half, decreasing basad.

Hypopygium.—Cercal plate broadened medially, flat, apically narrow and concave. Surstylus broad and curved, apically only weakly upturned. Bacilliform process slender, strongly curved ventrally. Ninth sternum very broad, laterally ribbed with a weak inner lateral process.

Female

Very close to that of *scyphocerca*, but with slightly larger lower squama, a few medial acrostical setulae, and uniformly pollinose abdomen.

Types

Holotype.—♂, Muskox Lake, Northwest Territories (64°45′N, 108°10′W), 25.VII.1953 (J. G. Chillcott) (C.N.C.) (Map 23).

Allotype.—♀, Salmita Mines, Northwest Territories (64°05′N, 111°15′W), 4.VII.1953 (J. G. Chillcott) (C.N.C.) (Map 23).

Fannia brooksi, new species

Figs. 52, 58

This species is definitely part of the *spathiophora* subgroup, but is characterized by the restriction of frontal bristles to the anterior half of the parafrontals and by the strictly biserial acrosticals and distinctly projecting lower squama. Length 4.5-5.0 mm.

Male

Head.—Frontal bristles four to six, restricted to anterior half. Parafrontals virtually linear near ocellar triangle (0.02 increasing to 0.05 mm.), silvery-

pollinose. Occipital bristles short, regular. Arista subpubescent. Palpus weakly spatulate.

Thorax.—Dark-brownish-pollinose. Acr. strictly biserial, the two rows rather broadly separated. Mesopleurals moderate, somewhat stronger dorsally. Squamae yellowish-white, the lower larger than the upper (ratio about 0.25 to 0.30). Haltere yellow.

Abdomen.—1.5 by 2.2 mm., rather broad. Pale brownish-grey- to bluish-grey-pollinose, darker caudad, the vitta distinct and triangulated.

Legs.—Medium brown to black, the knees faintly yellowish. F_2 as in *spathiophora*, the basal pv. moderate in size. T_2 with a weakly developed pv. ridge basad, becoming cylindrical and moderately enlarged on apical half; ventral mat about equal to tibial diameter. Mt_2 ventral crest small, about as long as broad, moderately consolidated. F_3 with only one distinct preapical av.; four or five distinct preapical pvs., basally setulose.

Hypopygium.—Cercal plate broadened medially, then strikingly constricted and deeply concave. Surstylus long and slender. Bacilliform process short, slender, very weakly spiralled. Ninth sternum slender, rather heavily sclerotized, with a short lateral process.

Female

Head.—Parafrontals grey-brown-pollinose, slightly narrower than normal. Palpus weakly spatulate.

Thorax.—Acr. strictly biserial. Squamae whitish, the lower moderately projecting, slightly smaller than upper.

Abdomen.—Greyish-brown-pollinose, weakly subshining.

Types

Holotype.—♂, Maynooth, Ontario, 29.VI.1953 (J. F. McAlpine) (C.N.C. No. 6659).

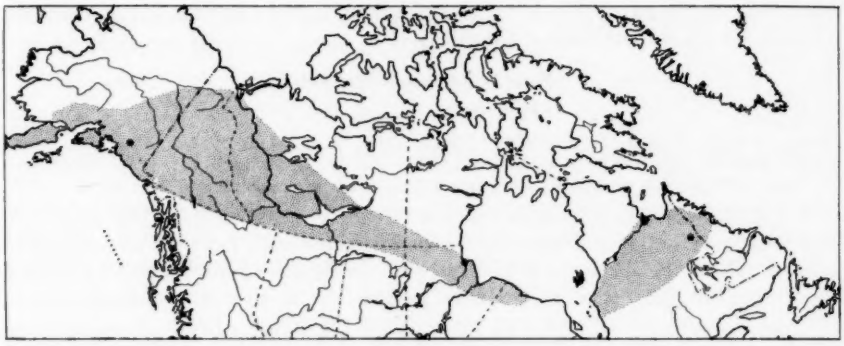
Allotype.—♀, Westree, Ontario, 23.VII.1929 (H. S. Fleming) (C.N.C.).

Paratypes.—4 ♂♂, 28 ♀♀, as follows: ONTARIO. 1 ♂, Chatham, 25.VIII.1928 (A. B. Baird). QUEBEC. 1 ♂, Abbotsford, 4.VI.1937 (G. E. Shewell); 1 ♀, Lac Phillipe, 31.VII.1955 (J. R. Vockeroth); 1 ♀, Mulvihill Brook, near Hull, 24.VI.1958 (W. W. Moss); 1 ♀, Laniel, 30.VI.1939 (J. L. Hitchon). MASSACHUSETTS. 1 ♂, Petersham, 2.VI.1914. NEW HAMPSHIRE. 1 ♂, White Mts. (Morrison); 1 ♀, Walker Bridge, 20.VI.1947 (Kindler). NEW YORK. 11 ♀♀, Raquette Lake, 26.VII.1946 (L. D. Beamer). MARYLAND. 1 ♀, Glen Echo, 1.VII.1923 (J. R. Malloch). ILLINOIS. 6 ♀♀, Urbana (Brownfield Woods), 16.V.1919; 1 ♀, Hopedale, 2.X.1917. NORTH CAROLINA. 3 ♀♀, Wilson's Gap (3100 ft.), Highlands, 12.V.1957 (J. R. Vockeroth); 1 ♀, Wayah Gap (3500 ft.), Macon Co., 10.VIII.1957 (J. G. Chillcott). TENNESSEE. 2 ♀♀, Greenbriar Cove, G.S.M.N.P. (2000 ft.), 18.V.1957 (J. R. Vockeroth). (Map 23).

Fannia scyphocerca, new species

Figs. 53, 59, 245

This species is obviously closely related to *brooksi* on the basis of male genitalic structure, and to the Palaearctic *bisetosa* by hind-femoral bristling, but can be recognized by having two (rarely three) strong preapical hind-femoral posteroventrals without erect setulae basad, and by the strictly biserial acrostical row. The very striking concavity of the apical portion of the cercal plate will easily separate the males from all related forms. Length 4.5-5.0 mm.



Map 24. Geographic distribution of *F. scyphocerca* Chill.

Male

Head.–Frontal bristles seven to nine, extending almost to ocellar triangle. Parafrontals narrow (0.02 increasing to 0.05 mm.), silvery. Occipital bristles short, regular. Arista subpubescent, narrowly thickened on basal third. Palpus weakly spatulate.

Thorax.–Dark-brown-pollinose. Acr. strictly biserial. Mesopleurals rather sparse and short. Squamae pale brown, with margins darker, lower sub-linear, partially expanded at inner edge. Haltere medium brown, the knob darker. Squamae and haltere very dark in eastern specimens.

Abdomen.–1.2 by 2.2 mm. Bluish-brown- to densely brown-pollinose. Median vitta present but largely obscured.

Legs.–Brown, the knees yellow. F_2 avs. with seven wide-spaced (equal to femoral diameter) on basal half, decreasing to a row of five, and a preapical doubled comb of nine; pvs. with basal weak, then finer but more doubled than the avs. to apex. T_2 as described for *brooksi*, the ventral mat half as long as tibial diameter. Mt_2 crest distinct, rather quadrate, pointed apically. F_3 with one long preapical av.; two strong preapical pvs.; setulose basad.

Hypopygium.–Cercal plate very broad medially, then suddenly narrowed and very strongly concave, forming a deep cup. Surstylus slender, apically weakly upturned. Bacilliform process short, slender, sharply curved basally. Ninth sternum broad, with a sublateral expansion and a lateral hooked process.

Female

Head.–Parafrontals lightly bluish-brown-pollinose. Palpus moderately spatulate.

Thorax.–Acr. evenly biserial or with a few median bristles just in front of the scutellum (unique). Squama with the lower narrow, only weakly lobate.

Abdomen.–Subshining basally, apical three segments glossy black.

Types

Holotype.– ♂, Indian House L., Quebec, 26.VII.1954 (W. R. Richards) (C.N.C. No. 6660).

Allotype.– ♀, same locality and collector, 24.VII.1954 (C.N.C.).

Paratypes.–2 ♂ ♂, Camp 327 (Alsk. Eng. Comm.), Alaska, 12.VII.1921, and 9.VII.1921; 1 ♂, Fort Chimo, Quebec, 9.VII.1954 (E. E. Sterns); 1 ♂, Fort

Churchill, Manitoba, 20.VI.1952 (J. G. Chillcott); 1 ♂, Rupert River, Quebec, 10.VII.1956 (J. R. McGillis). (Map 24).

Fannia aethiops Malloch

Figs. 54, 60, 181, 238, 239

Fannia aethiops Malloch, 1913, p. 628; Malloch, 1924a, p. 417; Gill, 1955, p. 652.
Fannia bisetosa Ringdahl, 1926, p. 105; Ringdahl, 1934, p. 117; Ringdahl, 1951, p. 167; Ringdahl, 1952, p. 156; Ringdahl, 1954a, p. 76 (tentative new synonymy).

This species was originally described from a mixed series. The type and one paratype from White Mts. and the series from Muir's Inlet are true *aethiops*, a third White Mt. specimen is *brooksi*, and the British Columbia and California specimens are *flavibasis*. *F. aethiops* proper has only a single strong hind-femoral av. and belongs to the *spathiophora* subgroup. From its relatives it can be recognized by the weak or absent mid-metatarsal crest, three to five long F_3 pvs., and medially depressed male cercal plate. It is rather variable in color and parafrontal width; the eastern specimens are usually dark with narrow parafrontals, while the Alaskan series is uniformly pale with broad parafrontals. Length 4.5-5.0 mm.

Male

Head.—Frontal bristles five to nine (eight and nine in type), usually extending to ocellar triangle. Parafrontals broad, expanding to 0.1 mm. at antennae, silvery, and separated by a linear frontal vitta (Alaskan specimens); to narrow, scarcely broadened toward antennae, contiguous and brownish-pollinose dorsad (eastern material, including type). Occipital bristles short, regular. Arista subpubescent. Palpus faintly spatulate.

Thorax.—Acr. usually fully triserial, median row irregular. Mesopleurals moderate, somewhat stronger dorsad. Squamae subequal, the lower scarcely projecting, from dark brown (White Mt., paratype) to pale brown (holotype) to clear yellowish-white (Alaskan material). Haltere similarly from dark brown to yellow. Wing membrane faintly browned (distinctly darker brown near the costa in darker eastern specimens).

Abdomen.—1.3 by 2.4 mm. Bluish-grey- to dark-brown-pollinose, the median vitta largely obscured, sublinear in most specimens.

Legs.—Black, in paler specimens with some or all knees yellowish. F_2 as described for *spathiophora*, the basal pv. short, not spine-like. T_2 slightly flattened basad, posteroventral ridge poorly developed, evenly and moderately expanded on apical half, ventral mat one-half to two-thirds tibial diameter. Mt_2 with basal crest weak to absent. F_3 with one strong preapical av.; three to five close-set, preapical pvs.; prostrate setulae basad.

Hypopygium.—Cercal plate broadened medially, concave almost from base, weakly upturned apically. Surstylus broad throughout, weakly upturned apically. Bacilliform process short, slender. Ninth sternum strongly sclerotized laterally and with strong medial and lateral hooked processes which bear one or several basal spines.

Female

Head.—Parafrontals distinctly grey-brown-pollinose. Parafacials distinctly visible, broad in profile (narrow in all related species). Theca slender, more elongate than normal. Palpus weakly spatulate.

Thorax.—Acr. triserial, at least postsuturally. Lower squama usually distinctly ovate, reaching to margin of upper.

Abdomen.—Subshining, brownish-black-pollinose.

Remarks

This species is almost certainly identical with the European *bisetosa* Ringdahl. I have two specimens, a male and a female, from Äre, Sweden which are virtually identical with Alaskan specimens and which also match Ringdahl's description. However, until a direct comparison with Ringdahl's type material is possible, the synonymy must be considered tentative.

Adults are known to be attracted to human excrement (Gill, 1955).

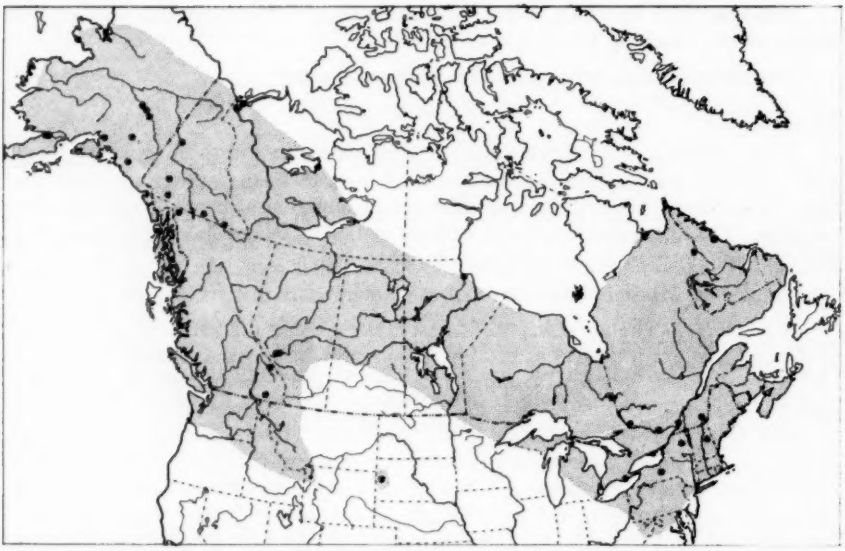
Variability.—The northwest-southeast cline in color and width of parafrontals in the males is not a perfect one. Of three males from Atlin, British Columbia, two are typically western in appearance, while the other is equally typically eastern. Specimens from Churchill, Manitoba, and Robson, British Columbia, are also typically western, while specimens from Yoho National Park, British Columbia, and Bilby, Alberta, are western in form and color. In addition, specimens from various localities in Ontario and southern Quebec are variable in color, yet have the narrower parafrontals of the eastern form. Based on parafrontal width and color, a division line can be drawn through British Columbia from south to north, then eastward along the 58th parallel to Hudson Bay, with a wide zone of contact between the two forms. However, since the variability in color and mid-metatarsal crest development appears to be about the same in both areas, and the differences in the parafrontals are so slight, it is necessary to consider them conspecific, and consider that *aethiops,* like its relatives *flavibasis* and *brevicauda,* is a highly variable species.

Records, 90 ♂♂, 124 ♀♀ (Map 25)

ALASKA. On tundra, Naknek, 10 ♂♂, 25 ♀♀; King Salmon, Naknek R., 9 ♂♂, 19 ♀♀; Nome, 2 ♂♂, 2 ♀♀; Big Delta, 1 ♂, 1 ♀; Camp 334 (Alsk. Eng. Comm.), 8 ♂♂, 5 ♀♀; Chitina, 4 ♂♂, 4 ♀♀; Matanuska, 1 ♀; Kotzebue, 1 ♀; Minchumina, 1 ♀; Paxson Lodge (4000 ft.), Gulkana, 1 ♀; Donnelly Dome, Richardson Hwy., 1 ♀; Anchorage, 4 ♀♀; Mile 315, Richardson Hwy., 1 ♂, 2 ♀♀; Shaw Creek, Mile 289 Richardson Hwy., 1 ♀; Muirs Inlet, 3 ♂♂, 3 ♀♀. YUKON. Watson Lake, 1 ♀; Dawson, 2 ♀♀; Bear Cr., Mile 1028 Alaska Hwy., 1 ♂; Mile 719 Alaska Hwy., 1 ♂; Mile 118 Haines Hwy., 1 ♂, 1 ♀; Rampart House, 1 ♀. NORTHWEST TERRITORIES. Aklavik, 4 ♂♂, 2 ♀♀; Reindeer Depot, Mackenzie Delta, 2 ♂♂, 4 ♀♀; Saw Mill Bay, 1 ♀. BRITISH COLUMBIA. Atlin (2200 ft.), 3 ♂♂, 6 ♀♀; Hinton, 1 ♀; Robson, 1 ♂, 1 ♀; Yoho National Park (Wapta, 5200 ft.), 1 ♂. ALBERTA. Bilby, 1 ♂; Elkwater, 1 ♀. MANITOBA. Churchill, 2 ♂♂. SOUTH DAKOTA. Spearfish, 1 ♀. ONTARIO. Simcoe, 1 ♀. QUEBEC. Fort Chimo, 2 ♀♀; Indian House L., 21 ♂♂, 22 ♀♀; Aylmer, 1 ♀; Laniel, 3 ♂♂; Megantic, 1 ♂; Little Mecatina Is., 1 ♂. LABRADOR. Nutak, 5 ♂♂, 1 ♀ (on *Salix*). NEW YORK. Otter Lake, 1 ♀; Mt. Hurricane, Essex Co., 1 ♂; Whiteface Mt., Adirondacks, 1 ♂. NEW HAMPSHIRE. White Mts., 2 ♂♂ (Type and paratype). NORTH CAROLINA. Highlands (3800 ft.), 2 ♀♀.

Collecting dates from June 5 to July 25.

I have seen 2 ♂♂, 1 ♀ from Sweden.



Map 25. Geographic distribution of *F. aethiops* Mall.

carbonaria Group

This group is composed of two rather distinct subgroups, the *carbonaria* subgroup and the *minutipalpis* subgroup. The first (sgp. 1) is composed of glossy flies of moderate size, with the hind coxae posteroventrally bare, the palpi normal, the female parafrontals broad and glossy with numerous setulae, and the tibial bristles doubled in both sexes, with one or more mid-tibial anteroventral bristles in the female. The second (sgp. 2) consists of small distinctly pollinose flies, with hind-coxal bristles and reduced palpi, the females with normal pollinose parafrontals, fewer tibial bristles in both sexes, and usually lacking the mid-tibial anteroventral bristle in the female.

The group as a whole can be recognized, by the triserial acrosticals, the single strong prealar, the hind femora bare at apex posteroventrally, and the mid-tibial bristles doubled.

Male

Head.–Frontal bristles seven to 13 (normally nine). Parafrontals contiguous, variable in structure, normally broad and silvery in the *carbonaria* subgroup, narrow and dull in the *minutipalpis* subgroup. Parafacials without setulae. Occipital bristles generally long and strong (sgp. 1), weak and regular (sgp. 2). Postoccipital bristles present or absent. Second antennal segment with a single strong bristle, third segment twice as long as broad. Arista subpubescent. Palpus at most weakly spatulate, normal in length or reduced to half thecal length; theca usually distinctly sclerotized, pollinose to subglossy.

Thorax.–Not vittate; black and subshining (sgp. 1), or densely grey- to brown-pollinose (sgp. 2). Acr. bristles triserial (at least postsuturally). Accessory setulae variable. Pra. 1, strong. Stigmatal setulae variable in number. Mesopleural setulae with dorsal row stronger only in sgp. 2. Scutellum normal.

Squamae subequal, lower distinctly smaller only in *corvina;* haltere black to yellow; wings often distinctly yellowish or brownish.

Legs.—Black, rarely yellowish in sgp. 1. F_1 pvs. variable. T_1 without distinct median bristles. F_2 with only moderately differentiated bristling; avs. short, often doubled beyond the middle; pvs. doubled on median third with a preapical comb. T_2 gradually thickened to apex, the mat sparse and short basad, increasing in length and thickening on apical half; no av., one to three (almost always two) ads., one to three (almost always two) pds.; never with single bristles on both surfaces. C_3 bare except in sgp. 2. F_3 with two to four preapical avs. (sgp. 2), four to six preapical avs. (sgp. 1), with short setulae basad; pvs. usually setulose on basal three-fourths, sometimes long setulose as long as femoral width, but never strongly bristled. T_3 with two avs., two ads. (three or four avs. and ads. in *polychaeta*).

Abdomen.—One-half to two-thirds as broad as long. Distinctly pollinose with a linear to triangular median vitta in the *minutipalpis* subgroup, glossy to weakly pollinose with vitta often indistinct in the *carbonaria* subgroup.

Hypopygium.—Usually inconspicuous. Cercal plate apically bipartite, hooking ventrally, usually with a median process more or less projecting dorsad (strongly projecting in most of sgp. 1). Surstylus situated medially, distinctly articulated, uneven in outline, often with a preapical process giving a bifid appearance; no inner basal process. Bacilliform rod only weakly developed, at most faintly spiralled; long and curved in *minutipalpis.* Ninth sternum usually slender, simple; aedeagus often with a ventral sclerotization. Fifth sternum broader than long, bristles fairly numerous and not strongly clustered at posterior margin, moderately robust.

Female

The differences between the two subgroups are so striking in this sex, that each subgroup will be described separately.

carbonaria subgroup

Head.—Parafrontals without trace of pollen, completely glossy, usually more than twice as broad as the frontal vitta (i.e., half as broad as long) and straight on inner margin; setulae numerous, not in definite rows. Theca glossy, distinctly swollen. Otherwise as in the male.

Thorax.—Usually identical with the male, except that squamae and haltere are paler, and wing tip often more infuscated.

Abdomen.—At most subpollinose, often the apical segments completely glossy.

Legs.—F_1 avs. strong only on apical half. F_2 avs. and pvs. completely setulose, no distinct bristles. T_2 with one to four avs., two ads., two or three pds., no or one pv. F_3 with three or four strong preapical avs. T_3 with one to five avs., two to four ads.

Ovipositor.—Rather simple and lacking in striking variation, only the spermathecae unusual in structure.

Subanal plate variable in proportions, sparsely but evenly bristled on disc. Cerci normal. Eighth tergum rather slender, reduced medially. Eighth sternum reduced to the usual pair of small setose plates without any basal sclerotization. Sixth and seventh segments normal, both posterior spiracles clearly in the sixth tergum.

Spermathecae two, strikingly enlarged, quite flattened in dried specimens, the apex indented, the surface strongly ringed throughout, and the duct base not sharply distinct from the body of the spermathecae. One exception is *fuscitibia* which has normal, subspherical, weakly ringed spermathecae.

minutipalpis subgroup

Head.—Parafrontals lightly pollinose, broad, about twice as wide as frontal vitta (i.e., one-third as broad as long), distinctly convex on inner margin; setulae in a single even row. Theca glossy, strongly swollen.

Thorax.—As in the male.

Abdomen.—Evenly but faintly pollinose throughout.

Legs.—F_1 pvs. weaker basad, but quite distinct and erect to base. F_2 avs. setulose on basal three-fourths, pvs. with distinct setulae decreasing apicad, then bare on apical half; distinct basal ventral present. T_2 with two ads., two pds., rarely a weak av. F_3 with two or three long preapical avs. T_3 with two avs., two ads.

Ovipositor.—Much as in the previous subgroup, the eighth tergum fully sclerotized, the eighth sternum sometimes with a weak basal sclerotization. Spermathecae less strikingly developed, normal in size, not strongly flattened and the rings less distinct.

Larva

Larvae are known only for *brevipalpis* (p. 133), so that no general description is possible.

carbonaria subgroup

Fannia carbonaria (Meigen)

Fig. 70

Anthomyia carbonaria Meigen, 1826, p. 154.
Ophyra carbonaria, Macquart, 1835, p. 308.
Aricia carbonaria, Zetterstedt, 1860, p. 6429.
Homalomyia carbonaria, Strobl, 1893, p. 240; Stein, 1895, p. 102; Pandellé, 1899, p. 179; Stein, 1900, p. 151.
Fannia carbonaria, Stein, 1907a, p. 658; Malloch, 1912a, p. 202; Stein, 1913, p. 25; Ringdahl, 1914, p. 146; Stein, 1915a, p. 28; Stein, 1916, p. 81; Riedel, 1919, p. 166; Séguy, 1923, p. 269; Malloch, 1924a, p. 419; Malloch, 1924b, p. 516; Ringdahl, 1928, p. 26; Karl, 1928, p. 61; Ringdahl, 1930, p. 4; Riedel, 1930, p. 79; Ringdahl, 1934a, p. 120; Tiensuu, 1935, p. 44; Karl, 1937, p. 128; Ringdahl, 1951, p. 167; Ringdahl, 1952, p. 156; Ringdahl, 1954a, p. 78; Hennig, 1955, p. 36, Figs. 42, 94; Collin, 1956, p. 86.
? *Anthomyia stygia* Meigen, 1826, p. 155; syn. *teste* Stein, 1895, 1907a.
? *Ophyra stygia,* Macquart, 1835, p. 309.
? *Aricia stygia,* Zetterstedt, 1845, p. 1560.
? *Anthomyia nigella* Meigen, 1826, p. 156; syn. *teste* Stein, 1895, 1907a.

This species is very rare in North America, and is closely related to *melanura,* separable with certainty only on male genitalic characters. From other species it can be separated by the setulose pvs. on F_3, and distinctly yellowed wing tips. Length 4.5-7.0 mm.

Male (Based on a North American specimen)

Head.—Frontal bristles 10 or 11. Parafrontals narrow (0.03 increasing to 0.08 mm.), the inner margin blackish, frons not projecting. Occipital bristles short, fine, regular. Postoccipital bristles absent. Basal antennal segments and palpus distinctly yellowish.

Thorax.—Acr. moderately long, weakly triserial postsuturally. Accessory setulae long and slender but quite sparse, intraalars weakly biserial. Stigmatal setulae three or four. Squamae yellow, the lower subequal to upper, distinctly projecting. Haltere yellow-brown. Wing veins yellow-brown, membrane moderately darkened near the costal margin.

Abdomen.—1.6 by 2.8 mm. Median vitta triangulated, vague in outline, obscured by light blue-grey pollen. Fifth segment distinctly subshining.

Legs.—Black, trochanters and knees yellowish. F_1 pvs. fine, decreasing basad. F_2 avs. short, at most two-thirds as long as femoral width basad, decreasing apicad to a short doubled comb of 10 to 12, with a few small preapical setulae; pvs. finer, more numerous. T_2 mat about one-third as long as tibial diameter where situated; two ads., one or two pds. F_3 pvs. setulose except for one stronger preapical bristle. T_3 with two avs., two ads.

Hypopygium.—Cercal plate elongate and not upcurved, broad basally, strongly constricted preapically with an apical flattened button, with a strong pair of contiguous ventral curved processes. Bacilliform process slender and rod-like. Surstylus heavy, quite irregular, without preapical "thumb".

Hennig's description (1955) states: Wing more or less intensively grey-brown, more yellowish at the tip. Halteres yellow. Squamae whitish, the lower only very slightly projecting. Legs black. T_2 with two ads., one pd., F_3 with four or five preapical avs.

Female (from Hennig, 1955)

Head.—Frontal vitta broader, two-thirds width of either parafrontal. Parafacials broader than in the male.

Thorax.—Wing often intensively yellowish.

Abdomen.—Without perceptible pollen, shining black.

Legs.—T_1 with zero to two ads., T_2 with three avs. (middle one stronger), two or three ads., three pds.

Type locality and type

Not known. Type in Muséum National d'Histoire Naturelle, Paris, France.

Remarks

The species is known in Europe from Scotland and northern Scandinavia, south to Sardinia and Hungary, and east to Formosa and Kamtschatka. Although the species is frequently recorded from North America, there is only one specimen in the material before me which matches Hennig's description and figures.

Records

British Columbia. Trinity Valley, 19.VI.1937, 1 ♂.

***Fannia melanura*, new species**

Figs. 72, 77, 187

Very close to the Holarctic *carbonaria*, separable with certainty only on the structure of the male genitalia. The distinctly darkened wing-tips and setulose F_3 pvs. separate it from the other species of the group. Length 5.0-7.0 mm.

Male

Head.—Frontal bristles seven to nine, with several weaker interstitial bristles. Parafrontals narrow (0.03 increasing to 0.10 mm.), weakly projecting beyond oral margin. Occipital bristles long and regular. Postoccipital bristles absent. Basal antennal segments yellowish, palpus black.

Thorax.—Acr. and accessory setulae moderate in length, sparse; intraalar setulae uniserial. Stigmatal setulae absent. Squamae whitish, lower shorter than upper and scarcely projecting. Haltere yellow. Wing veins yellowish-brown basad, brown apicad; membrane yellowish-brown, costal area distinctly darker apicad.

Abdomen.—1.6 by 2.8 mm. Median vitta black, distinct only in certain lights. Fifth segment glossy.

Legs.—Black, with coxae, trochanters, and knees yellowed. F_1 pvs. decreasing basad to half apical length. F_2 avs. short, two-thirds femoral width basad, then 10 to 12 in a short doubled comb, and six small preapical setulae; pvs. finer, more numerous. T_2 mat only one-third tibial diameter; two ads., two pds. F_3 pvs. completely setulose. T_3 with two avs., two ads., and a few erect posterior setulae.

Hypopygium.—Cercal plate small, not greatly elongate, not upcurved, only weakly constricted preapically, no ventral processes. Surstylus broad in lateral view, irregular in outline with a small preapical "thumb". Bacilliform process short, straight, weak.

Female

Head.—Frontal vitta narrower, one-third the width of either parafrontal. Postoccipital bristles completely absent.

Thorax.—Setulae very short and sparse. Stigmatal setulae absent. Wing strongly yellow-brown apicad. Lower squama shorter, not projecting.

Abdomen.—Only the fifth segment glossy, other segments lightly pollinose.

Legs.—T_2 with two to four avs., two or three ads., two or three pds., one pv. T_3 with three to five avs., two ads.

Remarks

The species occurs across the continent in a belt extending through southern Canada and northern United States, with an extension into the Canadian zone of Alaska.

Types

Holotype.— ♂, King Salmon, Naknek R., Alaska, 10.VII.1952 (J. B. Hartley) (C.N.C. No. 6661).

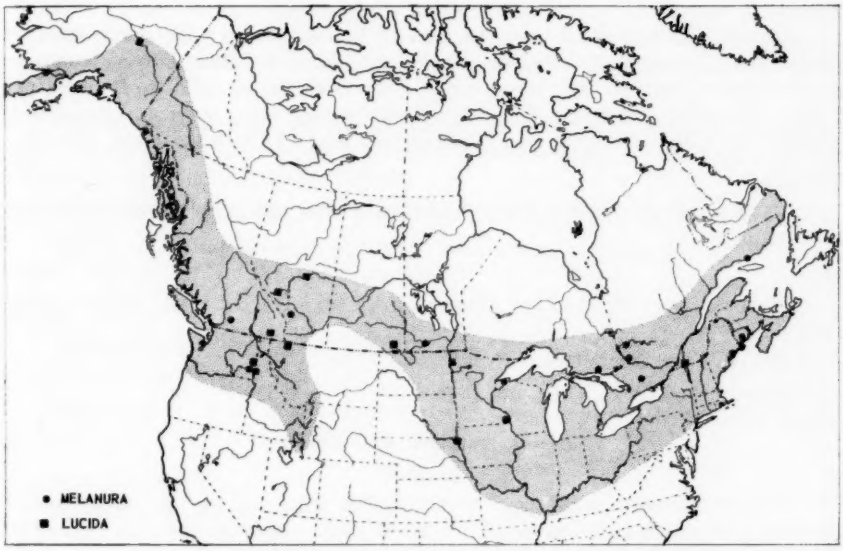
Allotype.— ♀, same data and locality (W. R. Mason) (C.N.C.).

Paratypes.—5 ♂♂, 11 ♀♀, as follows: ALASKA. type locality, (J. B. Hartley), 1 ♂, 10.VII.1952, 1 ♂, 3.VII.1952, 1 ♀, 16.VII.1952, 1 ♀, 18.VII.1952; on tundra, Naknek, 1 ♀, 18.VII.1952 (J. B. Hartley), 1 ♀, 20.VII.1952 (W. R. Mason). ONTARIO. Biscotasing (K. E. Schedl), 1 ♂, 20.VI.1930, 1 ♀, 6.VII.1930; Maynooth (J. F. McAlpine), 1 ♂ (at sapsuckers' wounds on *Alnus* sp.), 2.VII.1955, 4 ♀♀, 22.VI.1953. QUEBEC. Laniel (F. P. Ide), 1 ♂, 20.VI.1933, 1 ♂, 25.VI.1939, 1 ♀, 4.VII.1939, 1 ♀, 22.VII.1939, 1 ♀, 26.VII.1939.

Additional Records, 8 ♂♂, 12 ♀♀ (Map 26)

BRITISH COLUMBIA. Trinity Valley, 1 ♀. WASHINGTON. Pullman, 1 ♀. IDAHO. Moscow Mt., 1 ♂. ALBERTA. Kananaskis, 1 ♀. MANITOBA. Treesbank, 1 ♀. WISCONSIN. Brule R., Douglas Co., 1 ♂. QUEBEC. Godbout, 1 ♂; Barraute, Chapleau Co., 1 ♀. NEW BRUNSWICK. Charlo, 1 ♂. MAINE. Mt. Katahdin (5215 ft.), 1 ♀; Capens, 1 ♀; Machias, 1 ♀; Bar Harbor, 2 ♂♂. NEW HAMPSHIRE. Mt. Washington, 2 ♀♀; White Mts., 3 ♀♀.

Collecting dates from June 16 to August 23.



Map 26. Geographic distributions of *F. melanura* Chill. and *F. lucida* Chill.

Fannia borealis, new species

Figs. 71, 80

This species is closely related to *garretti* and *carbonaria*, and can be separated from both by the lack of distinct hind-femoral posteroventrals, the black antennae, and the more pollinose abdomen. In genitalic structure, it is the most primitive of the *norvegica* complex. Length 5.5 mm.

Male

Head.—Frontal bristles seven to nine, with a few interstitials. Parafrontals fairly broad (0.04 increasing to 0.14 mm.), frons not projecting. Occipital bristles moderately long, regular. Postoccipital bristles absent. Antenna and palpus black.

Thorax.—Acr. triserial only postsuturally. Acr. and accessory setulae moderate in length, sparse; intraalar setulae uniserial. Stigmatal setulae absent. Squamae whitish, subequal, the lower distinctly projecting. Haltere yellow. Wing clear.

Abdomen.—1.4 by 2.5 mm. Pollen bluish-grey, distinct on all segments, although weak on fifth. Median vitta distinct, narrowly triangulated.

Legs.—Black, at most the fore knees yellowish. F_2 as described for *lucida*. T_2 mat short, half tibial diameter; two ads., one or two pd. F_3 pvs. with only prostrate setulae, none distinctly erect or bristle-like. T_3 with two or three avs., two or three ads.

Hypopygium.—Cercal plate broad basally, then suddenly constricted to a long slender portion bearing an apical "button", the apical portion only weakly upcurved; ventral processes strong, well curved. Surstylus only moderately irregular, not strongly broadened basally, and with no preapical "thumb". Bacilliform process rod-shaped, well-developed, very weakly spiralled.

Female

Scarcely distinct from other females of the subgroup, with the following characters. Antenna and palpus black, acr. biserial presuturally, accessory setulae sparse and short. Wing only yellowish basally. Squamae whitish, lower somewhat projecting. Abdomen subshining, fifth segment completely glossy. T_2 with one or two avs., two ads., two pds. T_3 with three avs., two ads.

Remarks

There is no data on the biology of this species, and it is known from only one locality.

Types

Holotype.– ♂, McMurray, Alberta, 27.VI.1953 (G. E. Hall) (C.N.C. No. 6662).

Allotype.– ♀, same data (C.N.C.).

Paratypes.–2 ♂ ♂, 1 ♀, same data.

Fannia garretti, new species

Figs. 73, 79

Closely related to *lucida* and *norvegica* but separated by the weaker hind-femoral pvs. which fade out distally, and the more yellowish antennae. Length 5.0-6.5 mm.

Male

Head.–Frontal bristles usually seven to nine, with several interstitials. Parafrontals slender (0.04 increasing to 0.10 mm.), frons not projecting. Occipital bristles short and regular. Postoccipital bristles irregularly placed, often extending well toward vertex. Antenna and palpus variable from entirely yellow antenna and palpus to only base of antenna yellowed and palpus only faintly yellowish.

Thorax.–Acr. and accessory setulae moderate in length, sparse; intraalar setulae uniserial. A few long stigmatal setulae. Squamae subequal, yellowish, margin darker. Haltere yellow. Base of wing yellowish, apical portion clear.

Abdomen.–1.6 by 2.8 mm. Median vitta indistinct, obscured by light pollen. Apical segments faintly glossy, very lightly pollinose.

Legs.–Black, the knees yellowish. F_2 as described for *lucida*. T_2 mat short, half tibial diameter; two ads., one or two pds. F_3 with a full row of pvs. distinctly shifted to the posterior surface basad, increasing to half femoral width medially, reduced to setulae on apical fourth. T_3 with one to three avs., two or three ads.

Hypopygium.–Cercal plate with a broad elongate basal portion, the slender apex strongly upcurved with a small apical button, ventral processes long, weakly curved. Surstylus moderately broadened basally, with a weak preapical thumb and a small preapical dorsal process. Bacilliform process fairly well developed, slender and curving ventrally.

Female

Not as yet recognized.

Remarks

This species is so far known definitely only from the one locality in British Columbia, with the more tentative inclusion of one specimen from eastern North

America (Watertown, Connecticut), which differs rather strikingly from the type series, and may be distinct. However, since the male genitalia are identical in structure, it is probably at most only subspecifically distinct. It differs from the above description as follows:

Darker, antenna with only tip of second segment and aristal base yellowish. Palpus black. Occipital bristles long and irregular dorsad. Postoccipital bristles absent. Parafrontals somewhat broader.

Thorax more pollinose, scutellum (characteristically brown) grey-pollinose.

Abdomen definitely more pollinose, median vitta evident on the fifth segment. T_3 with one av., two or three ads.

Types

Holotype.—♂, Keremeos, British Columbia, 29.VI.1923 (C. B. Garrett) (C.N.C. No. 6663).

Paratypes.—5 ♂♂, as follows: 2 ♂♂, same locality, 26.VI.1923, 1 ♂, 25.VI.1923, 1 ♂, 12.VI.1923, and 1 ♂, 30.VI.1923.

Doubtful Record

Watertown, Connecticut, 5.VI.1931 (A. L. Melander).

Fannia lucida, new species

Figs. 74, 78, 188

This species is very close to the European *norvegica* and the Nearctic *garretti*, sharing with them the long pvs. on the hind femur, the clear wings and the completely pollinose abdomen; separable from *garretti* by the apically lengthening hind-femoral pvs., and from *norvegica* by the fewer tibial bristles. Length 5.5-7.0 mm.

Male

Head.—Frontal bristles nine to 13, with distinct interstitials. Parafrontals narrow (0.05 increasing to 0.10 mm.), not projecting. Occipital bristles long and regular. Postoccipital bristles absent. Antenna and palpus black, rarely basal antennal segments yellowish.

Thorax.—As described for *carbonaria*, but wing basally yellowish, apically clear. Squamae yellowish, margin darker; lower squama shorter than upper, scarcely or not at all projecting. Haltere yellow.

Abdomen.—1.6 by 3.0 mm. Median vitta black, faint. Pollen present on all segments, faintly so on the fifth.

Legs.—Black, not even the knees yellow. F_2 avs. strong, about eight on basal two-thirds, then a comb of six to eight preapically; pvs. finer, more numerous. T_2 mat short, at most half as long as tibial diameter; two ads., two pds. F_3 pvs. as a full row, gradually increasing in length from two-thirds femoral width at base to greater than femoral width at four-fifths, preapically with a few setulae.

Hypopygium.—Cercal plate with basal portion broad and elongate, the slender apical portion strongly upcurved, the apical button broadly cordate; ventral processes broad, rather short. Surstylus elaborately developed, with the basal portion much broadened, the preapical thumb and dorsal process well-developed. Bacilliform process slender, strongly curved.

Female

Head.—Frontal vitta narrower, one-third the width of the parafrontals. Postoccipital bristles completely absent.

Thorax.—Setulae very short and sparse. No stigmatal setulae. Wing somewhat darker apicad (less so than in *melanura*). Lower squama distinctly projecting, equal in length to upper.

Abdomen.—Only fifth segment glossy, other segments lightly pollinose.

Legs.—T_2 with one to three avs., two ads., two pds. T_3 with three to five avs., two ads.

Types

Holotype.— ♂, Rockglen, Saskatchewan (49°11′, 105°56′), 21.VI.1955 (J. R. Vockeroth) (C.N.C. No. 6664).

Allotype.— ♀, Edmonton, Alberta, 5.VI.1925 (Owen Bryant) (C.N.C.).

Paratypes.—11 ♂♂, 3 ♀♀, as follows: QUEBEC. 4 ♂♂, Abbotsford, 14.V.1936 (G. E. Shewell). NEW YORK. 1 ♂, Cranberry Lake, 1.IV.1917 (C. J. Drake). MINNESOTA. 1 ♂, Kittson Co., 15.VI.1941 (Page Nicholson); 1 ♂, Eitzen, Houston Co., 24.VI.1948 (S. Parfin). IOWA. 1 ♀, Sioux City, 10.VI.1949 (Slater and Laffoon). ALBERTA. 1 ♂, Bilby, 8.VI.1924 (O. Bryant). MONTANA. 2 ♀♀, Glacier Park Sta. (4800 ft.), VII.1924 (J. M. Aldrich). WASHINGTON. 1 ♂, Valleyford, 17.V.1924 (A. L. Melander). BRITISH COLUMBIA. 1 ♂, Robson, 24.IV.1949 (H. R. Foxlee). ALASKA. 1 ♂, Mile 315, Richardson Hwy., 8.VI.1951 (W. R. M. Mason). (Map 26).

Remarks

This species is undoubtedly very close to *norvegica* (cf. hypopygium illustrated by Collin, 1958), but the median cercal process is much straighter and the surstylus less strongly modified than in that species.

Fannia corvina (Verrall)

Figs. 68, 78, 185

Homalomyia corvina Verrall, 1892, p. 149; Stein, 1895, p. 102; Meade, 1897, p. 65; Stein, 1900, p. 151; Wingate, 1906, p. 282; Kramer, 1917, p. 41.
Fannia corvina, Collin, 1958, p. 86.
Fannia halterata Ringdahl, 1918, p. 149; Hennig, 1955, p. 46, Figs. 51, 82; syn. *teste* Collin, 1958.
Fannia "matterata Ringdahl", in Séguy, 1937, p. 171.
Fannia carbonaria var. (form), Ringdahl, 1934a, p. 120; Ringdahl, 1954a, p. 79.

A black subshining species with at most the knees yellowed, recognized by the brownish-black halteres and full postoccipital bristle row. The male genitalia also are quite distinct from those of all other species of this group. Length 5.0-7.0 mm.

Male

Head.—Frontal bristles eight to 12, usually nine. Parafrontals narrow, (0.03 increasing to 0.07-0.10 mm.), frons not projecting. Occipital bristles long, irregular. Postoccipital bristles uniserial, extending to verticals. Antenna and palpus black.

Thorax.—Acr. and accessory setulae long and hair-like, triserial postsuturally; intraalar setulae irregularly triserial. Stigmatal setulae usually six. Squamae yellowish-white, lower almost as long as upper and distinctly projecting. Stalk of haltere yellow-brown, knob dark brown. Wing veins brown, membrane only slightly darkened.

Abdomen.—1.4 by 2.5 mm. Median vitta triangulated, vague in outline, obscured by blue-grey pollen. Fifth segment distinctly subshining.

Legs.—F_1 pvs. strong, in a complete row. F_2 avs. six to eight, short and strong on basal half, then a comb of about 15 to apex, closer-set apicad; pvs. with one strong basal, then a series equal to femoral width basad, decreasing to a short comb of about nine on apical fourth. T_2 mat on apical half thick and short (half tibial diameter where situated); two ads., two pds. F_3 pvs. setulose, present only on basal half. T_3 with one to three avs., two ads., several erect setulae on apical half of posterior surface.

Hypopygium.—Cercal plate broad, not elongate, with no median process but with two short lateral hooks. Surstylus irregular but without special processes. Bacilliform process short, slender, rod-shaped.

Female

Head.—Parafrontals 2.5 times as wide as frontal vitta. Frons not projecting beyond oral margin. Postoccipital row distinct only in about half of the females.

Thorax.—Setulae shorter and sparser. Only one or two stigmatal setulae. Wing clear, veins yellow. Squamae white, subequal. Haltere yellow.

Abdomen.—Two apical segments fully glossy, some specimens with medial fourth faintly pollinose.

Legs.—T_2 with one av., two ads., two or three pds. T_3 with one to three avs., three or four ads.

Type locality and type

Devon, England. Type in Collin collection, Newmarket, England. Dissected and examined by Collin, 1958.

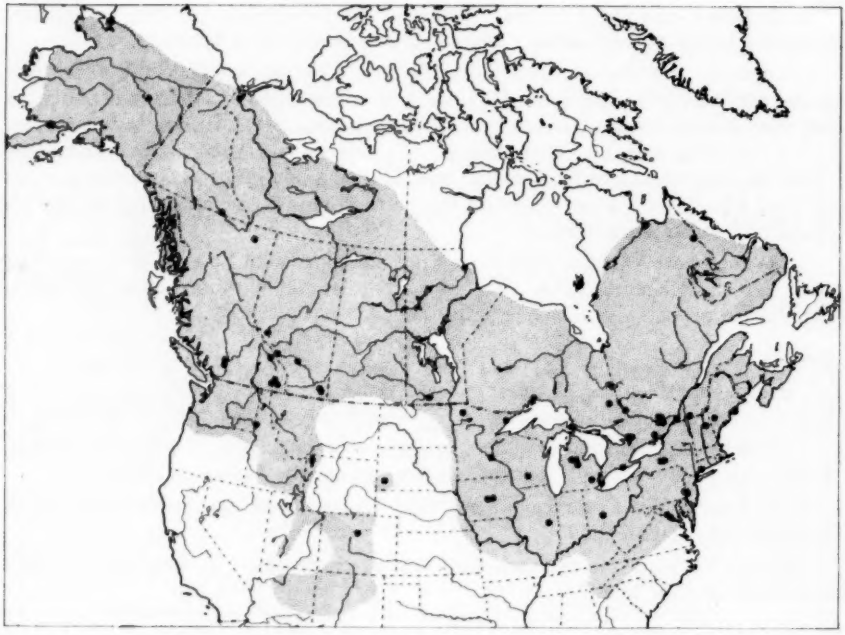
Type locality of *halterata*: Abisko, Sweden. Type in Ringdahl collection, Hälsingborg, Sweden.

Remarks

The species is known in Europe from northern Sweden, Scotland, and several localities in England. In North America, it is widespread through the Canadian and Hudsonian zones from coast to coast, and is the commonest species of the subgroup.

Records, 94 ♂♂, 103 ♀♀ (Map 27)

ALASKA. Kotzebue, 3 ♂♂; Badenburg Butte, 1 ♂; Matanuska, 4 ♂♂, 2 ♀♀; Naknek (on tundra), 1 ♂, 2 ♀♀; King Salmon, Naknek R., 1 ♂, 1 ♀; Savonoski, Naknek Lake, 1 ♂; Cold Bay (163°W), 2 ♀♀; Snug Harbor, 1 ♂; Nome, 2 ♂♂; Fairbanks, 1 ♀; Muirs Inlet, 2 ♂♂. NORTHWEST TERRITORIES. Aklavik, 1 ♂, 1 ♀. YUKON TERRITORIES. Watson Lake, 2 ♀♀. BRITISH COLUMBIA. Ft. Nelson, 2 ♂♂, 5 ♀♀; Cranbrook, 1 ♂; Lillooet, 4 ♂♂, 2 ♀♀; Robson, 5 ♂♂, 9 ♀♀; Clinton, 3 ♂♂, 3 ♀♀; Cultus Lake, 1 ♂; Kaslo, 1 ♂; Yoho Natl. Pk., 1 ♂, 1 ♀. ALBERTA. Banff, 3 ♂♂, 5 ♀♀; Bilby, 1 ♂; Medicine Hat, 1 ♂; Turner Valley, 1 ♂; Elkwater, 2 ♂♂, 1 ♀; Oldman R., Lethbridge, 1 ♀. IDAHO. Moscow, 1 ♂. COLORADO. Pingree Park, 1 ♂; Yellowstone Natl. Pk., 1 ♂, 1 ♀. MANITOBA. Aweme, 1 ♂, 1 ♀; Churchill, 2 ♂♂. SOUTH DAKOTA. Sylvan Lake, 1 ♂. MINNESOTA. Grand Marais, 2 ♂♂; 3 mi. south of Afton, 1 ♂; Middle River, 1 ♂. WISCONSIN. Devil's Lake, 1 ♂. MICHIGAN. Clare Co., 1 ♂; Macomb Co., 1 ♂; Osceola Co., 1 ♂; Midland Co., 1 ♀. IOWA. Ledges State Park, 3 ♂♂, 1 ♀; Ames,



Map 27. Geographic distribution of *F. corvina* (Verrall).

1 ♂, 1 ♀. ONTARIO. Ottawa, 2 ♂♂, 2 ♀♀; Marmora, 2 ♀♀; Sault Ste. Marie, 1 ♀; Miner's Bay, 1 ♂; Charlton, 1 ♂; Severn, 1 ♀; Macdiarmid, 1 ♀; Almonte, 2 ♀♀; Chatham, 1 ♀; Simcoe, 1 ♀. QUEBEC. Fort Chimo, 15 ♂♂, 8 ♀♀; Great Whale River, 2 ♀♀; Indian House Lake, 6 ♂♂, 14 ♀♀; Tobatière, 1 ♂; Laniel, 6 ♀♀; Abbotsford, 5 ♀♀; Cottage Beaulieu, 1 ♀; Hull, 2 ♀♀; Meach Lake, 1 ♀; Beech Grove, 1 ♀; Old Chelsea, 1 ♀; Rigaud, 1 ♀. MAINE. Echo Lake, Mt. Desert, 1 ♀. CONNECTICUT. Reading, 1 ♂. NEW HAMPSHIRE. Franconia, 1 ♀. NEW YORK. Ithaca, 2 ♂♂, 2 ♀♀; Tompkins Co., 1 ♀. PENNSYLVANIA. Roxborough, 2 ♀♀; Montgomery Co., 1 ♂. OHIO. Columbus, 1 ♀. ILLINOIS. Urbana, 1 ♀. MARYLAND. near Plummer's Island, 1 ♀. VIRGINIA. Dead Run, Fairfax Co., 1 ♂. GEORGIA. Indian Springs, 2 ♂♂.

Collecting dates from May 24 to August 29, the majority collected in June.

Fannia fuscitibia Stein

Figs. 69, 76, 186, 266

Fannia fuscitibia Stein, 1920, p. 42; Malloch, 1924b, p. 515.

Closely related to *corvina*, distinguished by the distinctly yellowish joints of legs and antennae, the lack of stigmatal setulae and postoccipital bristles, and by the yellow halteres. It is also very close to *coracula* Collin, but differs in the structure of the cercal plate. From other species of the group, it can be recognized by the completely prostrate pv. setulae on F_3, and glossy fifth abdominal segment. Length 5.0-7.0 mm.

Male

Head.–Frontal bristles nine, strong, without interstitials. Parafrontals narrow (0.03 increasing to 0.09 mm.), frons not projecting. Occipital bristles strong and regular. Postoccipital bristles absent. Antenna and palpus black, basal antennal segments yellowed.

Thorax.–Acr. triserial postsuturally, short and strong. Accessory setulae scanty, intraalars usually only uniserial. Stigmatal setulae absent. Squamae white, lower distinctly smaller than upper. Haltere yellow. Wing veins yellow, membrane clear.

Abdomen.–Median vitta as in *corvina*, except that the apical half of the fourth and all of the fifth segment are completely glossy.

Legs.–F_1 pvs. usually short and weak only on basal fifth. F_2 usually with fewer, more differentiated bristles, but sometimes identical with *corvina*. T_2 and F_3 as described for *corvina*. T_3 as described for *corvina*, except that there are no distinct erect posterior setulae.

Hypopygium.–Cercal plate broad, not elongate, with no median process but two strong, sublateral hooks. Surstylus very irregular in outline with median and preapical expansions. Bacilliform process slender, weakly spiralled.

Female

Head.–Frontal vitta usually narrower, one-third width of parafrontals. Postoccipital bristles absent.

Thorax.–Thoracic setulae very short and sparse. Wing membrane and squamae clear whitish, haltere and wing veins yellow.

Abdomen.–Usually with the fourth segment entirely pollinose, more rarely glossy laterally.

Legs.–T_2 with one av., two ads., two pds. T_3 with three avs., two ads.

Type locality and type

Moscow Mt., Idaho. Type in Zoologisches Museum, Berlin, Germany.

Remarks

This species is widespread throughout the Canadian zone areas of North America.

Records, 14 ♂♂, 16 ♀♀ (Map 28)

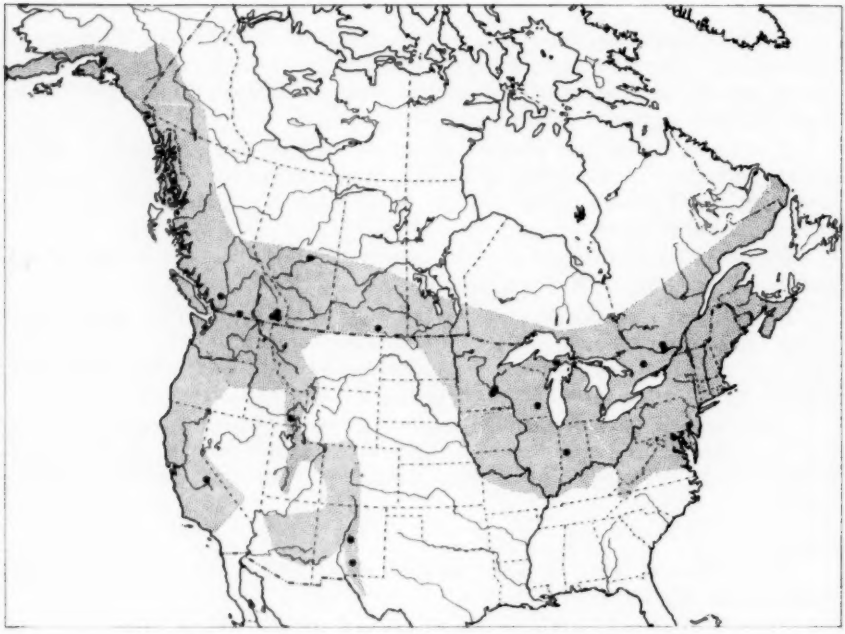
ALASKA. Anchorage, 1 ♂, 1 ♀. BRITISH COLUMBIA. Lillooet, 1 ♂; Trinity Valley, 1 ♂; Robson, 1 ♂; St. Mary's, 1 ♀. ALBERTA. Edmonton, 1 ♂. IDAHO. Cub River Canyon, 1 ♂; Moscow Mt., 1 ♀ (holotype). CALIFORNIA. Sequoia Nat. Pk., 1 ♀. NEW MEXICO. Tajique, 1 ♀; Cloudcroft, 1 ♀. MINNESOTA. Itasca Park, 1 ♀; Carver Co., 1 ♀. WISCONSIN. Dane Co., 1 ♀. MICHIGAN. Schoolcraft Co., 1 ♀. INDIANA. Lafayette, 1 ♂. QUEBEC. Harrington Lake, 1 ♂; Hull, 1 ♀. ONTARIO. Maynooth, 2 ♀♀; Waubamie, 1 ♀. NEW HAMPSHIRE. White Mts., 3 ♀♀; Franconia, 1 ♀. PENNSYLVANIA. Swarthmore, 1 ♂; no locality, 1 ♂. VIRGINIA. Chain Bridge, 1 ♂. NORTH CAROLINA. Highlands (3800 ft.), 1 ♂.

minutipalpis subgroup

Fannia brevipalpis, new species

Figs. 64, 67, 182, 267, 268

This species is part of the *minutipalpis* subgroup, with densely blue-grey-pollinose abdomen and reduced palpi. It is distinguished from all but *minuti-*



Map 28. Geographic distribution of *F. fuscitibia* Stein.

palpis by the linear abdominal vitta, and from that species by the more numerous mid-tibial bristles and flatter, less swollen male cercal plate. Length 4.5 mm.

Male

Head.—Frontal bristles seven to nine, without interstitial bristles. Parafrontals dull silvery, narrow (0.05 increasing to 0.10 mm.). Frons evenly rounded, scarcely projecting. Occipital bristles fine and regular. A complete row of postoccipital bristles present. Theca at most faintly pollinose. Palpus distinctly reduced, about half thecal length.

Thorax.—Evenly grey-pollinose. Acr. only partially triserial postsuturally. Accessory setulae sparse, intraalars uniserial. Stigmatal setulae one to three. Mesopleurals sparse, setulose, dorsal row distinctly stronger.

Abdomen.—1.4 by 2.2 mm. Strongly grey-blue-pollinose, the median vitta obscured and linear in appearance.

Legs.—Black, at most the knees yellowish. F_1 pvs. strong to base. F_2 avs. basally 1.5 times as long as femoral width, seven to 10 long on basal half, then 10 shorter, equal to femoral width, a break, and three or four preapical setulae; pvs. similar, less differentiated and finer. T_2 mat half tibial diameter; two or three ads., two pds. F_3 avs. in a complete row, basally equal to femoral width, preapically with two or three stronger; pvs. half femoral width, distinct on basal two-thirds. T_3 with one or two avs., two ads.

Hypopygium.—Cercal plate broad, not elongate, with a small median button and two sublateral hooks. Surstylus short, regular, except for a weak, subbasal dorsal expansion. Bacilliform process short, weakly spiralled.

Female

Head.—Postoccipital bristle row complete.

Thorax.—Acr. with very weak medial row. Mesopleurals sparse, dorsal row stronger, distinctly bristle-like.

Abdomen.—Evenly but faintly pollinose.

Legs.—F_2 av. and pv. setulae long and erect on basal half. F_3 with three strong preapicals.

Larva (Fig. 268)

Integument granulate (minutely tuberculate), the granules outlining distinctly polygonal bare areas anteriorly, more scattered and in indistinct rows posteriorly on each segment. Laterodorsal processes strong, with distinctly bifurcate or trifurcate lateral projections on basal half or two-thirds, equally developed on all segments except the first thoracic, those on caudal segment longest laterally; lateroventral, dorsolateral, and dorsal processes absent. Cephalic process of first thoracic segment long, lateral process absent. Anterior spiracular processes distinct but very small, approximately eight in number. Posterior spiracular stalk situated almost on lateral margin, short, the spiracular processes irregularly arranged, the posterior one distinct, other two very short. Mouth hooks partially atrophied, very slender and weakly sclerotized.

Description based on four larvae, two from near Highlands, North Carolina, one from Jefferson City, Missouri, and one from Plummer's Island, Maryland; all collected in leaf litter, the first two from mixed deciduous forest, the third from oak-hickory forest. The identification as *brevipalpis* is only tentative, based on similar habitats, distribution, and abundance.

Remarks

This species, with *neopolychaeta*, has been frequently misidentified as either of the two European species *minutipalpis* or *polychaeta*, since the leg bristling of the Nearctic forms is intermediate to that of the two European species. However, the male genitalia are quite distinctive. This species occupies most of the eastern part of North America, being replaced in the west by *neopolychaeta*.

It is commonly collected in oak-hickory or mixed deciduous forest, and the larvae have been collected from between three-year-old oak leaves on the forest floor.

Types

Holotype.—♂, Cold Spring Harbor, L.I., New York, 10.V.1931 (C. H. Curran) (A.M.N.H.).

Allotype.—♀, Riverhead, L.I., New York, 27.V.1934 (Blanton and Borders) (C.N.C. No. 6665).

Paratypes.—48 ♂♂, 8 ♀♀, as follows: NEW YORK. 9 ♂♂, same data as holotype; 2 ♂♂, Babylon, L.I., 22.V.1936 (Blanton and Borders); 1 ♂, Halfway Hollow Hills, L.I., 18.V.1935 (Blanton and Borders). MARYLAND. 5 ♂♂, Plummers I. (R. C. Shannon), collected 23.IV.1914, 28.IV.1907, 25.IV.1915, 28.IV.1914 and 4.V.1914. ILLINOIS. Urbana, 5 ♂♂, 1 ♀, 25.IV.1919; 1 ♂, 5.V.1932; 1 ♂, 18.IV.1919. KANSAS. 4 ♂♂, 6 ♀♀, Lawrence, 30.IV.1956 (J. G. Chillcott). NORTH CAROLINA. 19 ♂♂, Highlands (3800 ft.), 9.V.1957 (J. R. Vockeroth). GEORGIA. 1 ♀, Indian Springs, 8-13.IV.1940 (H. C. Huckett); 1 ♂, Clayton, 15-22.IV.1940 (H. C. Huckett).

Additional Records, 48 ♂♂, 71 ♀♀ (Map 29)

GEORGIA. Blood Mt., 1 ♂. NORTH CAROLINA. Black Mt. (N. Fork Swannanoa), 1 ♀; Highlands (3800 ft.), 3 ♂♂, 4 ♀♀; Whiteside Mt. (4900 ft.), nr. Highlands, 1 ♀. VIRGINIA. Great Falls, 2 ♂♂, 3 ♀♀; Falls Church, 2 ♀♀; Dead Run, Fairfax Co., 1 ♂, 3 ♀♀. MARYLAND. Beltsville, 1 ♂; College Park, 1 ♂; C. & O. Canal, 7-locks, 1 ♂; Hyattsville, 1 ♀; Baltimore, 1 ♀; East Neck I., Kent Co., 1 ♂; Plummers I., 1 ♀. DISTRICT OF COLUMBIA. Washington, 2 ♂♂. OHIO. Sugar Grove, 1 ♂; Summit Co., 1 ♀; Columbus, 1 ♀. PENNSYLVANIA. Folsom, 1 ♀; Swarthmore, 1 ♀; Spring Brook, 1 ♂, 2 ♀♀. NEW JERSEY. Clementon, 1 ♂. NEW YORK. Lakeville, L.I., 1 ♀; Ithaca, 1 ♂, 2 ♀♀; Salden, 1 ♂; Montauk, L.I., 1 ♀; Tompkins Co., 1 ♀; Baiting Hollow, L.I., 2 ♂♂; Caroline-Harford, 1 ♂; Broadalbin, 1 ♀. CONNECTICUT. 1 ♂ (no data). MASSACHUSETTS. New Bedford, 1 ♂, 3 ♀♀; no locality, 1 ♂, 1♀. NEW HAMPSHIRE. 2 ♂♂. MAINE. Bar Harbor, 1 ♀. QUEBEC. Kingsmere, 3 ♂♂, 1 ♀; Old Chelsea, 1 ♂, 3 ♀♀; Lac Mondor, 3 ♂♂; Harrington Lake, 1 ♂, 4 ♀♀. ONTARIO. Roebuck, Grenville Co. (around pine infested with *Xylla* sp.), 1 ♂; Maynooth, 1 ♀; Marmora, 2 ♀♀; Blackburn, 1 ♀; Orillia, 1 ♀. MICHIGAN. Clare Co., 1 ♂; Midland Co., 1 ♂; Isabella Co., 1 ♂; Saginaw Co., 1 ♀; Wexford Co., 1 ♂; Genessee Co., 1 ♀; Oakland Co., 1 ♀; Schoolcraft Co., 1 ♀. WISCONSIN. Madison, 1 ♂, 1 ♀; Dane Co., 2 ♂♂, 1 ♀. ILLINOIS. Effingham, 1 ♂; Charleston, 1 ♀; Meredosia, 1 ♀; White Heath, 3 ♀♀; Dubois, 2 ♀♀; Dongola, 1 ♀; Algonquin, 1 ♀. IOWA. Ledges State Park, 2 ♂♂; Ames, 1 ♂, 1 ♀. MISSOURI. St. Louis, 1 ♂; Atherton, 3 ♀♀; Stoddard Co., 2 ♀♀. KANSAS. Pottawatomie Co., 1 ♂, 2 ♀♀.

Collecting dates from May 27 to June 27, with the majority in May.

Fannia neopolychaeta, new species

Figs. 61, 66, 183

This species is a southwestern form apparently replacing *brevipalpis* in the prairie and montane areas. It is differentiated from that species by the narrower abdomen and strongly triangulated median vitta. From *trigonifera,* the northwestern species, it is separated by the complete row of postoccipital bristles and paler coloration. From *nitida* Stein it is separated by the more elongate surstylus and cercal plate. Length 3.5-4.0 mm.

Male

Head.—As described for *brevipalpis* but the parafrontals generally broader (0.06 increasing to 0.12 mm.).

Thorax.—More greyish-pollinose, but otherwise as described for *brevipalpis.*

Abdomen.—1.2 by 2.2 mm. Grey-pollinose, the pollen weaker than in *brevipalpis,* the median vitta distinct and clearly triangulated.

Legs.—Black, at most the knees yellowish. F_1 pvs. strong to base. F_2 avs. with two or three on basal third as long as femoral width, then four shorter on medial third, a comb of about 10, a break and three preapical setulae; pvs. similar, finer, less differentiated. T_2 mat almost as long as tibial diameter, two or three ads., two pds. F_3 avs. in a full row, basally two-thirds femoral width, preapically with three or four stronger bristles widespread; pvs. as in *brevipalpis.* T_3 with two avs., two ads.

Hypopygium.—Cercal plate slender, not elongate, with no median "button", but two long median processes ("hooks") which are only weakly curved. Sur-

stylus only slightly irregular, with a distinct preapical dorsal expansion. Bacilliform process absent or very weakly developed.

Female

Head.—As described for *brevipalpis.*

Thorax.—Acr. with weak medial row. Mesopleurals sparse, dorsal row weak, at most three stronger bristles toward the anterior edge.

Abdomen.—As described for *brevipalpis.*

Legs.—F_2 avs. and pvs. weaker, the setulae scarcely erect. T_2 rarely with a weak av. bristle. F_3 with two or three preapical avs.

Remarks

See note under *brevipalpis.* This species is predominantly western in distribution, replacing *brevipalpis* in the western half of North America. It is known from Minnesota west to British Columbia and south to New Mexico.

Types

Holotype.— ♂, St. Victor, Saskatchewan (49°20′, 105°54′), 27.VI.1955 (J. R. Vockeroth) (C.N.C. No. 6666).

Allotype.— ♀, Scout Lake, Saskatchewan (49°40′, 106°0′), 17.VI.1955 (J. R. Vockeroth) (C.N.C.).

Paratypes.—10 ♂♂, 19 ♀♀, as follows: BRITISH COLUMBIA. Robson (H. R. Foxlee): 1 ♂, 9.V.1949, 1 ♂, 7.VI.1949, 1 ♀, 2.VII.1952; 1 ♀, Cultus Lake, 15.VII.1948 (H. R. Foxlee); 1 ♂, Lake Erroch nr. Deroche, 3.VII.1953 (G. J. Spencer); 1 ♀, Fairmont, 28.VI.1926 (A. A. Dennys). ALBERTA. Bilby (O. Bryant): 1 ♂, 22.VI.1924, 1 ♀, 30.VI.1924; Edmonton (O. Bryant): 1 ♂, 20.VI.1924, 1 ♀, 1.VI.1925. SASKATCHEWAN. 1 ♀, Saskatoon, 19.VI.1926 (K. M. King). MINNESOTA. Two Harbours (M. H. Hatch): 2 ♂♂, 23.VI.1927, 1 ♀, 26.VI.1927, 1 ♀, 3.VII.1927. NEW MEXICO. 1 ♂, Tajique, 25.VI.1940 (R. H. Beamer); 3 ♀♀, Cloudcroft, 27.VI.1940 (D. E. Hardy) (L. C. Kuitert) (L. J. Lipovsky); 3 ♀♀, Cloudcroft (no collector), 17.V.1902, 21.V.1902, 27.V.1902. ARIZONA. 1 ♂, Jemez Springs, 1.VII.1945 (Bert Hodgen); 4 ♀♀, Rustlers Pk., Chiricahua Mts., 5.VII.1940 (2, E. E. Kenago) (1, L. J. Lipovsky) (1, D. E. Hardy); 1 ♀, White Mts., 19.VI.1950 (H. O. Wright); 1 ♀, Flagstaff, 8.VII.1941 (E. L. Todd). TEXAS. 1 ♀, Dallas, 19.IV.1916 (J. M. Aldrich). (Map 29).

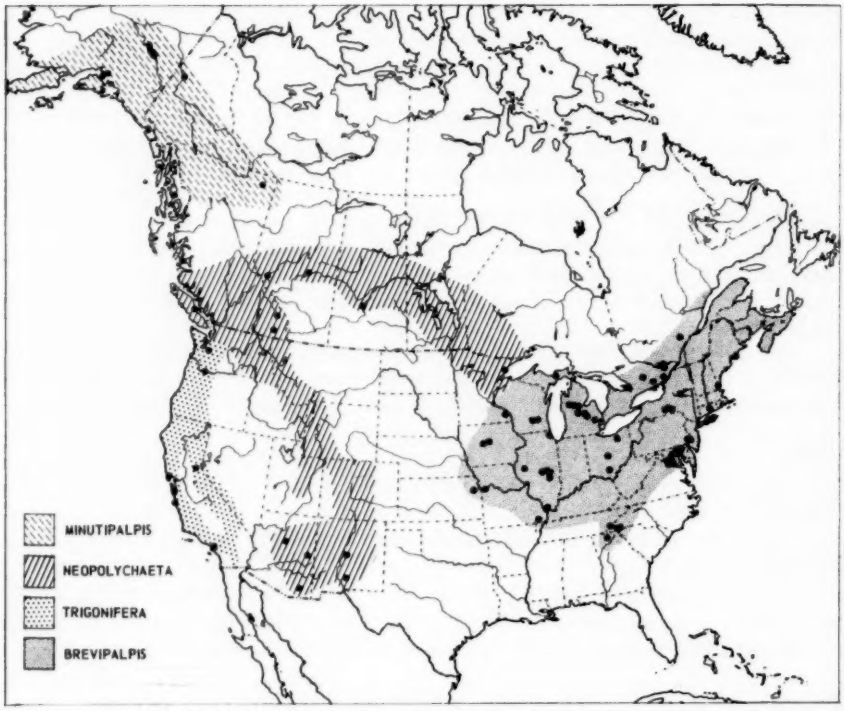
Fannia trigonifera, new species

Figs. 62, 65

This species at first appears to be only a darker form of *neopolychaeta*, but the lack of a distinct postoccipital row, the more numerous frontal bristles, and simpler mid-femoral bristling distinguish it. In male genitalic structure, it is closest to *brevipalpis*, and quite distinct from *neopolychaeta.* It is probably closest to the ancestral stock of this trio of species.

Male

Head.—Frontal bristles 10 to 13, close-set. Parafrontals, parafacials, and genae yellowish-brown-pollinose (unique), more rarely greyish. Parafrontals quite narrow (0.04 increasing to 0.08 mm.). Frons scarcely projecting. Occipital bristles fine, regular. No distinct postoccipital bristles dorsad. Proboscis as in *brevipalpis.*



Map 29. Geographic distribution of *F. minutipalpis* complex.

Thorax.—Dark-brown-pollinose, more rarely greyish. Squamae and haltere brown. Otherwise as described for *brevipalpis.*

Abdomen.—1.4 by 2.2 mm. Strongly brownish-pollinose, the median vitta triangulated, somewhat obscured by pollen.

Legs.—Black, at most the knees yellow. F_1 pvs. strong to base. F_2 avs. with six to eight bristles on basal half, at most equal to femoral width, apically with a simple comb of five to seven bristles; pvs. weaker. T_2 mat about one-third tibial diameter; two ads., one or two pds. F_3 and T_3 as described for *neopolychaeta.*

Hypopygium.—Cercal plate broad, not elongate, with a slender median button and two slender sublateral hooks. Surstylus regular except for a median dorsal expansion. Bacilliform process short, weakly spiralled.

Female

Head, Thorax and *Abdomen.*—As in *brevipalpis.*

Legs.—F_2 avs. and pvs. setulose throughout. F_3 with two widely-separated strong preapical avs.

Types

Holotype.—♂, Monterey, California, 10.VIII.1938 (R. I. Sailer) (Snow Entomological Museum).

Allotype.– ♀, Pacific, California, 9.VIII.1940 (D. E. Hardy). (Snow Entomological Museum).

Paratypes.–4 ♂♂, 1 ♀, as follows: CALIFORNIA. 1 ♂, Glendale, 8.X.1951 (W. M. Schlinger); 1 ♂, Morgan Hill, 6.IX.1939 (R. K. Johnston); 1 ♀, Muir Woods, 30.VIII.1903 (J. C. Bradley). WASHINGTON. 1 ♂, Puyallup, 19.VII.1932 (J. Wilcox); 1 ♂, N. Bonneville, 10.VII.1935 (R. H. Beamer). (Map 28).

Fannia minutipalpis (Stein)

Figs. 63, 184

Homalomyia minutipalpis Stein, 1895, p. 106; Pandellé, 1899, p. 193.

Fannia minutipalpis, Stein, 1907a, p. 662; Stein, 1913, p. 26; 1916, p. 81; Stein, 1918, p. 154; Karl, 1928, p. 62; Ringdahl, 1934a, p. 117; Tiensuu, 1935, p. 44; Karl, 1937, p. 128; Ringdahl, 1952, p. 156; Ringdahl, 1954a, p. 75; Hennig, 1955, p. 61, Figs. 53, 72; Collin, 1958, p. 88.

This species, which has been erroneously recorded numerous times from North America, has so far been recognized by this author only from the far northwest.

It is very close to *brevipalpis* in general appearance, but can be separated by the darker halteres, preapically strong hind-femoral posteroventrals and distinct male genitalic structure, the strongly swollen cercal plate often obvious externally. It averages slightly smaller in size and differs from *brevipalpis* as follows:

Male

Head.–Frontal bristles eight to 11, with a few interstitials.

Thorax.–Acr. rarely with median bristles. Stigmatals with three to six setulae. Squamae and wing pale brown. Knob of haltere dark brown.

Abdomen.–About 1.3 by 2.0 mm., rather broader than in *brevipalpis*. Bluish-brown-pollinose, the median vitta more distinct and subtriangular.

Legs.–T_2 typically with two ads., one pd. (Hennig's description says two pds., but there is only one in the material before me). F_3 pvs. with one or two stronger at two-thirds. T_3 with (one or) two avs., one (or two) ads.

Hypopygium.–Cercal plate broad, not elongate, strongly swollen, with two heavy sublateral hooks. Surstylus highly irregular with a strong median dorsal expansion. Bacilliform process elongate, strongly curved upward and outward.

Female

Almost indistinguishable from *brevipalpis*, although usually without any median acrostical setulae, and the mid-femoral setulae only suberect and weak. The ovipositor structure (arrangement of spiracles) is the only certain character for separating the two.

Type locality and type

Genthin, Germany. Type in Zoologisches Museum, Berlin, Germany.

Remarks

This species is known in Europe from southern Sweden and Finland south to Hungary It is also recorded from Formosa. It is only known in this region from northwestern Canada and Alaska.

Records, 4 ♂♂, 10 ♀♀ (Map 28)

ALASKA. Matanuska, 3 ♂♂, 4 ♀♀; Anchorage, 1 ♀; Big Delta, 1 ♂; Mile 315 Richardson Hwy., 2 ♀♀; Shaw Creek, Mile 289 Richardson Hwy., 1 ♀. YUKON. Dawson, 1 ♀. BRITISH COLUMBIA. Fort Nelson, 1 ♀.

I have also seen specimens from Germany and China.

Collecting dates from May 31 to July 16, the majority in early June.

kowarzi Group

This group is known from a single Holarctic species, and the description is based on this and another as yet undescribed species from Suifu, China. The affinities of the group are very difficult to determine. It belongs to the main stem of the genus and shows vague relationship with the *carbonaria*, *hirticeps*, and *mutica* groups. The striking male genitalia cannot be easily related to those of other groups, and the chaetotaxy is largely primitive.

Male

Head.—Frontal bristles nine to 12, with only a few interstitials. Parafrontals slender, almost contiguous, variable in color. Parafacials without setulae. Occipital bristles long, fine, somewhat irregular. Postoccipital bristles in a complete and irregular row. Second antennal segment with a single strong bristle, third segment twice as long as broad. Arista subpubescent. Palpus linear; theca subglossy and rather slender, weakly sclerotized.

Thorax.—Black, dark brownish-grey-pollinose, nonvittate. Acr. bristles fully triserial to biserial except for a few median setulae. Accessory setulae moderate or sparse and short. Prealars two, subequal. Stigmatal setulae many. Mesopleural setulae many, the dorsal row slightly stronger. Scutellar disc bare. Squamae subequal, the lower slightly projecting; haltere and squamae yellow; wing pale brown, veins dark.

Abdomen.—Two-fifths to three-fifths as broad as long. Brownish-pollinose, the median vitta triangular, more or less obscured.

Legs.—Black, at most the knees yellowish. F_1 pvs. in a full row, weak on basal half. T_1 without median bristles. F_2 avs. strong, moderately differentiated, as long as femoral width on basal half, shorter and closer-set on apical portion; pvs. with a strong basal, long bristles on basal two-thirds, with a preapical comb. T_2 evenly expanding to apex, not distinctly modified; mat distinct only on apical half, almost as long as tibial diameter; one ad., two pds. (rarely as much as two ads. and four pds.). Mt_2 with a short inconspicuous basal clump. C_3 bare. F_3 normally developed; avs. setulose except for one or two preapically strong; pvs. setulose on basal half, apically absent, posteriorly with a clump of short curled hairs at three-quarters. T_3 with two or three avs., one ad., and several erect setulae on median posterior surface.

Hypopygium.—Cercal plate strongly fused basally, apically developed into two strong, rounded, and laterally flattened lobes. Surstylus broadly attached, only slightly articulated, swollen on basal portion, constricted preapically, then broadened apically. Bacilliform process long, curved outwardly, scimitar-shaped. Ninth sternum simple, strap-like laterally; aedeagus membranous. Fifth sternum much broader than long, the bristles crowded toward the caudal margin, strong laterally.

Female

See description of female of *kowarzi*.

Fannia kowarzi (Verrall)

Figs. 81, 82, 189

Homalomyia kowarzi Verrall, 1892, p. 149; Stein, 1895, p. 83; Meade, 1897, p. 67; Wingate, 1906, p. 281.

Fannia kowarzi, Stein, 1907a, p. 661; Ringdahl, 1912, p. 213; Malloch, 1913, p. 630, Fig. 6; Karl, 1928, p. 61; Ringdahl, 1934a, p. 119; Tiensuu, 1938, p. 30; Ringdahl, 1952, p. 156; Ringdahl, 1954a, p. 78; Hennig, 1955, p. 53, Figs. 44, 83; Collin, 1958, p. 91.

This species, which is Holarctic in distribution, has no close Nearctic relatives, although there are relatives in the southern Palaearctic region. It may be recognized by the complete postoccipital row, duplicated mid-tibial bristles, and one anteroventral and a short thick clump of preapical posteroventrals on the hind femur. Length 4.5-5.0 mm.

Male

Head.—Frontal bristles nine to 12, with a few interstitials. Parafrontals narrow (0.04 mm. increasing to 0.10), almost contiguous, golden-yellow to silvery.

Thorax.—Acr. with complete but irregular median row. Accessory setulae moderate. Squamae and haltere sometimes quite dark.

Abdomen.—Rather broad, 1.8 by 2.5 mm. Brownish-grey-pollinose, the pollen obscuring most of the triangulated median vitta.

Legs.—F_2 avs. with eight or nine as long as femoral width on basal half, changing to a shorter, partially doubled comb of about 15, ceasing before the preapical constriction; pvs. with 10 or 11 bristles on basal two-thirds, duplicated ventrally on the median third, changing suddenly to a strong single comb of about six bristles, preapically setulose. F_3 with one (rarely two) strong preapical avs., setulae basad; pvs. setulose to one-half with a posterior patch of 20 to 30 curled hairs on a slight enlargement. T_3 with two or three avs.

Female

Head.—Parafrontals broad, one-third as broad as long, convex on inner margin, frontal vitta as broad as either parafrontal, frontal bristles only strong anteriorly. Parafrontal setulae uniserial. Postoccipital bristle row complete. Theca as in the male.

Thorax.—Acr. with very weak median row. Accessory thoracics sparse. Otherwise as in the male.

Abdomen.—Evenly but faintly pollinose.

Legs.—F_2 avs. with long setulae on basal three-fourths, pvs. setulose with a distinct but weak basal. T_1 normal. T_2 with one ad., two pds. F_3 avs. setulose except for two strong preapicals, pvs. evenly setulose. T_3 with only one av.

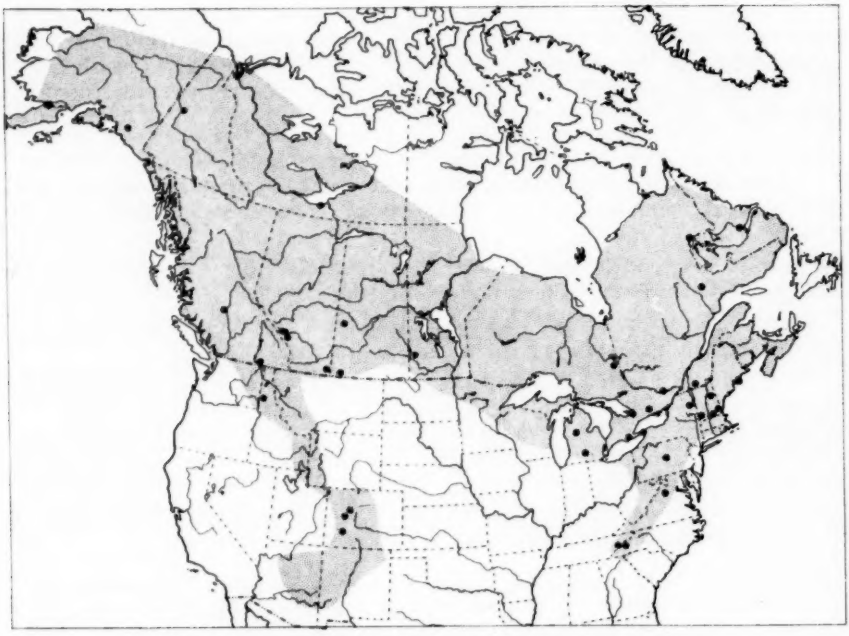
Ovipositor.—Subanal plate about as long as broad, rounded apically, evenly setulose on disc; cerci normal. Eighth tergum normal, not reduced medially, sternum reduced to a pair of setose sclerites of moderate size, and a pair of basal sclerotized areas with inner stem-like processes. Seventh sternum about as long as broad, distinctly separated from tergum. Sixth segment normal. Seventh spiracle in sixth tergum, sixth in membrane behind fifth tergum. Spermathecae two, spherical, smooth. Duct base rather short, moderately curved.

Type locality and type

England, between Matlock and Matlock Bath. Type in Collin collection, Newmarket, England.

Records, 65 ♂♂, 44 ♀♀ (Map 30)

ALASKA. On tundra, Naknek, 10 ♂♂, 4 ♀♀; King Salmon, Naknek R., 5 ♂♂, 1 ♀; Chitina, 2 ♂♂, 1 ♀. YUKON. Dawson, 1 ♀. NORTHWEST TERRITORIES. Aklavik, 1 ♂, 1 ♀; Hay River, 1 ♀. BRITISH COLUMBIA. Robson, 6 ♂♂, 2 ♀♀; Atlin (2200 ft.), 2 ♀♀; Bowser, 1 ♀; Lillooet, 1 ♂. ALBERTA. McMurray, 1 ♂; High River, 1 ♂; Kananaskis, 1 ♂; Banff, 1 ♂; Elkwater Park, 1 ♀. IDAHO. Potlatch, 1 ♀. MONTANA. Missoula, 1 ♂.



Map 30. Geographic distribution of *F. kowarzi* (Verrall).

COLORADO. Spring Creek Pass, 1 ♂, 1 ♀; Gothic, 1 ♂; Tennessee Pass, 1 ♀. SASKATCHEWAN. Cut Knife, 10 ♀♀; Scout Lake, 1 ♂. MANITOBA. Birtle, 1 ♂. MICHIGAN. Clare Co., 1 ♂; Branch Co., 1 ♀; Saginaw Co., 1 ♂. ONTARIO. Abitibi Region, 1 ♂; Orillia, 1 ♂; Marmora, 1 ♂, 1 ♀; Simcoe, 1 ♂; Niagara Glen, 4 ♂♂, 3 ♀♀. QUEBEC. Old Chelsea, 1 ♂; Aylmer, 1 ♂; Abbotsford, 1 ♂; Lac Mondor, 2 ♂♂, 3 ♀♀; Knob Lake, 1 ♂. LABRADOR. Goose Bay, 1 ♀. NOVA SCOTIA. Truro, 1 ♂. MAINE. Mt. Desert, 1 ♂; S. W. Harbor, 1 ♂. NEW HAMPSHIRE. Franconia, 1 ♂; Durham, 1 ♀; Jaffrey, 1 ♀; Britton Woods, 1 ♂. VERMONT. Lynden, 2 ♂♂, 2 ♀♀; Manchester, 1 ♂, 1 ♀. NEW YORK. Ithaca, 1 ♂; Mt. Hurricane, Essex Co., 1 ♂; Thatcher Park, Albany, 1 ♂. PENNSYLVANIA. North Mt., 1 ♂. NORTH CAROLINA. Mt. Mitchell (6000 ft.), 2 ♂♂, 1 ♀; Forney Ridge, G.S.M.N.P. (6000 ft.), 1 ♀; Whiteside Mt. (4900 ft.), nr. Highlands, 1 ♀. TENNESSEE. Beech Gap, Gatlinburg (5500 ft.), 1 ♀.

Collecting dates from May 19 to August 25, the majority in early June.

pretiosa Group

This is a rather heterogeneous assemblage of species, mainly because of the inclusion of *curvipes* and *arcuata*, aberrant forms with arcuate and clavate hind femora. The group is characterized by the unbristled hind coxa, distinctly projecting lower squama, and by the hind-tibial bristling (two to four avs., and one ad., except in *arcuata* which has a full row of ads.).

Its closest affinities appear to be with the *mutica* and *benjamini* groups.

Included in this group are the Nearctic species *penepretiosa*, *depressa*, *elongata*, *neomexicana*, *leucogaster*, *curvipes*, *gilvitarsis*, and *arcuata;* and the Palaearctic *pretiosa*, and, tentatively, *fasciculata*.

Male

Head.—Frontal bristles six to 10 (11 to 13 in *gilvitarsis* and *arcuata*), slender, with few interstitials. Parafrontals silvery, contiguous or almost so, variable in width. Occipital bristles usually short and regular. Postoccipital bristles absent. (Occipitals long, irregular, with full postoccipital row in *arcuata*). Second antennal segment with a single strong bristle, third segment twice as long as broad. Arista pubescent to subpubescent. Palpus at most weakly broadened apically; theca pollinose, weakly to moderately sclerotized, slender.

Thorax.—Greyish-brown- to dark-brown-pollinose, not vittate or with only faint vittae visible between acr. and dsc. bristles. Acr. bristles evenly triserial (weakly quadriserial postsuturally in *arcuata*). Accessory setulae usually short and sparse, intraalar row usually uniserial. Prealars variable (absent, one strong, or two subequal). Stigmatal setulae few or none. Mesopleurals moderate, not stronger dorsad. Scutellum bare discally. Squamae whitish, equal, the lower distinctly projecting (weakly so in *penepretiosa*); haltere yellow; wing clear.

Abdomen.—Two-fifths to three-fifths as broad as long. Variable from strongly yellow and lightly pollinose with strongly triangulated median vitta, to unicolorous black and dark blue-grey- or brown-pollinose with vitta largely obscured.

Legs.—Entirely yellow (except tarsi) to entirely black, not even the knees yellowed. T_1 with no median bristles. F_1 pvs. from full strong row to strong only on apical half. C_2 with normal bristles. F_2 avs. only weakly differentiated, decreasing evenly from base to a simple preapical comb, well-differentiated in *curvipes, gilvitarsis,* and *arcuata;* pvs. similar, duplicated ventrally only on median third (basal three-fourths in *arcuata*). T_2 usually weakly developed, evenly and lightly thickened from base to apex; ventral mat short and sparse basally, increasing and thickening until equal to tibial width apically. In *curvipes, gilvitarsis,* and *arcuata* the tibia is distinctly deformed with a basal swelling, a medial flattening, and then enlarged to twice basal diameter. T_2 medially with one (rarely two) ads., one pd. Mt_2 unmodified. C_3 bare. F_3 normally simple, avs. with three to six strong preapicals, erect setulae basad (long in *penepretiosa* and *gilvitarsis*); a ventral row of erect setulae; pvs. long, fine, increasing apicad (setulose in *depressa*). F_3 in *curvipes* and *arcuata* deformed and arcuate, flattened basally with a distinct preapical thickening; avs. long and distinct, increasing apicad; pvs. long and fine in *arcuata*, absent mesally in *curvipes*, preapically clumped, long, and curled, five preapical bristles in *arcuata*, about 20 in *curvipes*. T_3 normally with two to four avs., one ad. (three or four ads. in *depressa* and a full row in *arcuata*).

Hypopygium.—Cercal plate well fused medially, short to elongate, straight and convex dorsally. Surstylus expanded at outer margin, elongate and simple except in *arcuata*, usually broad and deep with a row of long setulae medially on ventral surface, except in *curvipes* and *arcuata*. Bacilliform process clearly in the form of a corkscrew, except in *curvipes* and *arcuata* where the process is straight and rod-like, or absent. Ninth sternum simple, slender, or with a subbasal process; aedeagus membranous. Fifth sternum broader than long, more or less strongly indented medially, with a sublaterally produced angle anteriorly. Bristles somewhat compressed anteriorly.

Female

Coloration and pollinosity generally as in the male.

Head.—Parafrontals pollinose, from one-third to one-fifth as broad as long. Parafrontal setulae uniserial or irregularly biserial. Parafacials bare, without

reflecting spot. Occipital bristles regular. Postoccipital bristles absent except in *arcuata*. Theca pollinose to weakly shining, normally weakly sclerotized, stronger in *arcuata*. Palpus linear to slightly broadened apically.

Thorax.—As in the male.

Abdomen.—Nonvittate, yellow to subpollinose to black.

Legs.—F_1 pvs. strong on apical half, setulose basad. F_2 avs. and pvs. setulose, or with two to four distinct avs. on basal third, the basal pv. distinct. F_3 normal or faintly curved; two or three preapical avs., setulose basad; pvs. setulose. T_3 with two to five avs., one or two ads.

Ovipositor.—Length normal. Subanal plate broader than long, rounded apically, evenly setulose on disc; cerci normal. Eighth tergum normal, not reduced medially; eighth sternum reduced to a pair of setose sclerites, variable in shape and size, often with a simple basal sclerotization which is not connected. Seventh sternum normally longer than broad, distinctly separated (in *arcuata* broad and fused with the seventh tergum). Sixth sternum and tergum separate in all species; the sternum variable in proportions, the tergum enclosing both spiracles, which are set well within the sclerite. Spermathecae three (one smaller in *arcuata*), pear-shaped, variable from smooth to distinctly ringed, apically indented. Duct base rather short, moderately curved.

Larva

Integument weakly or not at all reticulate; granulate or minutely tuberculate, these protruberances forming irregular rows or polygonal bare areas (within reticulations where present). Laterodorsal processes weak and sparsely branched to strong with seven pairs of distinct lateral processes, lateral projections where developed very broad with usually short apical furcations; always present on caudal segment, the three pairs subequal in length. Lateroventral processes absent or short and weakly branched; dorsal processes small to very small, weakly branched in ? *arcuata;* dorsolateral processes absent to moderately distinct. Cephalic processes of first thoracic segment short to long, lateral processes absent to very short. Anterior spiracular processes distinct but short, about ten in number. Posterior spiracular stalk situated on disc, well separated from margin, short to very short, spiracular processes radially arranged and very short, often fused together. Mouth hooks well developed.

Description based on numerous third instar larvae and puparia of *curvipes* from a Berlese sample of oak forest leaf litter near Highlands, North Carolina, and on a single third instar larva from a malt trap near Mexico City, Mexico, tentatively identified as *arcuata*, new species.

Remarks

F. curvipes, penepretiosa, and *depressa* are mainly Canadian-zone species, the latter two continent-wide. *F. neomexicana, elongata,* and *leucogaster* are western or northwestern species, and *arcuata* and *gilvitarsis* are so far known only from Mexico.

Fannia penepretiosa, new species

Figs. 83, 90, 190

Fannia pretiosa of Malloch, 1913a, p. 630; Malloch, 1924a, p. 418; Malloch, 1924b, p. 515.

This species is very close to *pretiosa* Schiner, but the latter has distinct male genitalia, one rather than two hind-tibial anteroventrals, and (according to the

description) only one row of posteroventrals on the hind femur (no mention of long ventral setulae). There are no close Nearctic relatives, and it is easily recognized from other species of the group by the yellow legs, abdomen, and apex of scutellum, and the presence of only two hind-tibial anteroventrals. Length about 5.0 mm.

Male

Head.—Frontal bristles nine, slender, without interstitials. Parafrontals narrow (0.04 increasing to 0.06 mm.). Occipital bristles short, regular. Second antennal segment and base of third yellowish, arista pubescent.

Thorax.—Brownish-grey-pollinose, faintly vittate, apical half of scutellum yellow. Pra. one or two, short but distinct. One or more stigmatal setulae. Squamae whitish, the lower slightly smaller (five-sixths length of upper), scarcely projecting. Haltere yellow. Wing veins yellow-brown, membrane clear.

Abdomen.—1.7 by 2.8 mm. Yellow, except for dark sublinear median vitta, and broad infuscations on fourth and fifth segments.

Legs.—Entirely yellow, except for tarsi. F_2 avs. with five or six strong on basal two-thirds, then four or five shorter and closer-set, and a preapical comb; pvs. with a strong basal, and an even row (equal to femoral diameter basally) decreasing to apex, with only a few weak setulae ventrad. F_3 avs. in a full row, two-thirds femoral width basally, the three or four preapicals stronger; ventral and posteroventral surfaces with long fine hairs (as long as femoral width), somewhat longer apicad. T_3 with two avs., one ad.

Hypopygium.—Cercal plate slender, weakly elongate, not apically broadened. Surstylus simple, short, evenly tapering to apex, with a row of four bristles basally and ventrally. Bacilliform process distinctly spiralled. Fifth sternum strongly concave apically with lateral projections, bristles reduced, not scattered.

Female

Antennae partially, humeri, legs, abdomen, and apical half of scutellum yellow.

Head.—Parafrontals pollinose, rather narrow, one-fourth as broad as long. Parafrontal setulae uniserial. Arista distinctly pubescent.

Thorax.—Much as in the male, the lateral angles of scutellum dark.

Abdomen.—Clear yellow, pale-whitish-pollinose.

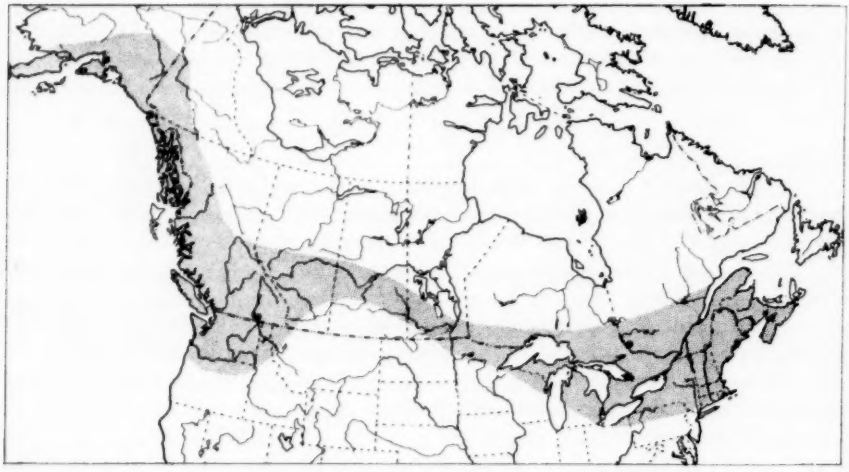
Legs.—F_2 evenly setulose ventrally. T_2 rarely with a weaker bristle dorsad of usual ad. and pd. bristles. F_3 with two strong preapical avs. T_3 with two or three avs., one ad.

Types

Holotype.—♂, Laniel, Quebec, 19.VII.1939 (F. P. Ide) (C.N.C. No. 6668).

Allotype.—♀, same data, 12.VII.1939 (C.N.C.).

Paratypes.—7 ♂♂, 12 ♀♀, as follows: QUEBEC. Laniel (F. P. Ide) 1939: 10.VII, 1 ♂; 12.VII, 2 ♂♂, 1 ♀; 24.VII, 1 ♀, 1 ♂; 28.VII, 3 ♀♀. MAINE. 1 ♂, Machias, 21.VII (C. W. Johnson). NEW YORK. 1 ♀, Troy, 14.IX.1949 (U.S.P.H.S. fly trap). ONTARIO. 1 ♀, Midland, 20.VII.1955 (J. G. Chillcott). NORTH CAROLINA. 1 ♂, Highlands (3800 ft.), 20.VI.1957 (J. R. Vockeroth). MINNESOTA. 1 ♀, Cook Co., 10.VIII.1949 (F. Snyder). BRITISH COLUMBIA. 2 ♂♂, Robson, 28.VII.1950 (H. R. Foxlee). ALASKA. 4 ♀♀, Anchorage, 22.VII.1951 (R. S. Bigelow). (Map 31).



Map 31. Geographic distribution of *F. penepretiosa* Chill.

Fannia depressa (Stein)

Figs. 84, 91, 191

Homalomyia depressa Stein, 1897, p. 173.
Fannia depressa, Malloch, 1924a, p. 420.

This species appears at first glance to be a member of the *canicularis* group, but the genitalic structure and the lack of a hind-coxal bristle places it properly in this group. It can be recognized by the hind-tibial bristling (three or four avs. and ads.), prostrate hind-femoral pvs., and general dark coloration. Its closest relative is probably *penepretiosa.* Length 4 mm.

Male

Head.—Frontal bristles nine, slender, with a few interstitials. Parafrontals narrow, scarcely expanded toward antennae. Occipital bristles short, regular. Antenna black, arista pubescent.

Thorax.—Dark-brown-pollinose, nonvittate. Pra. two, short but distinct. One or no stigmatal setulae. Squamae faintly brownish, the lower distinctly longer, strongly projecting. Haltere yellow. Wing veins dark brown.

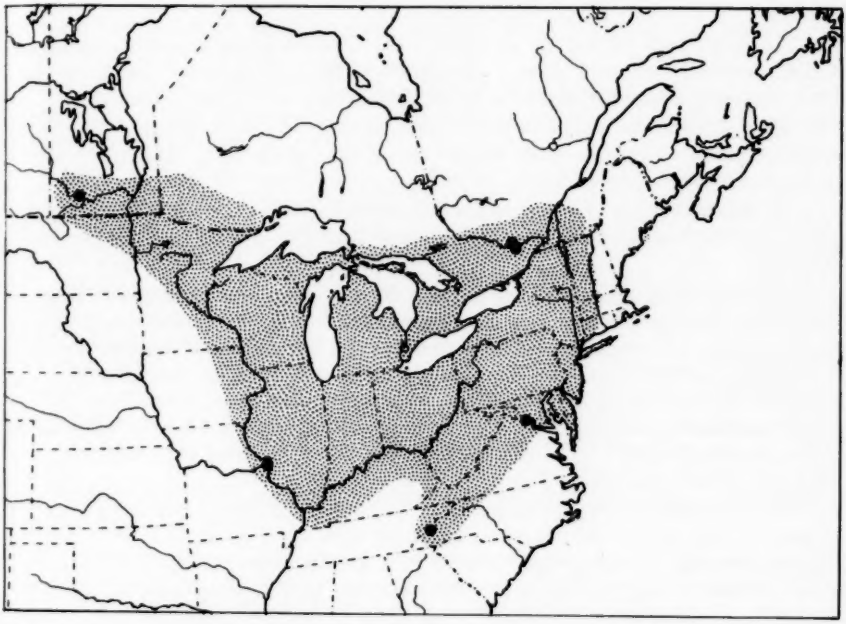
Abdomen.—1.3 by 2.0 mm. Brownish-grey-pollinose, the median vitta largely obscured, only vaguely indicated.

Legs.—Black (reddish-brown on type), at most the knees yellowish. F_2 avs. sparse, four on basal half, then three shorter, and the preapical comb; pvs. with basal weak, then a moderately long series decreasing evenly apicad, distinctly doubled on the apical half ventrally. F_3 avs. with three or four preapicals strong, erect setulae basad; pvs. setulose. T_3 with three or four avs., three or four ads.

Hypopygium.—Cercal plate broad, not elongate. Surstylus short, simple, with a weak dorsal swelling basally, then evenly tapering, without ventral bristles. Bacilliform process and fifth sternum similar to those of *penepretiosa.*

Female

Head.—Parafrontals pollinose, one-third as broad as long, the setulae uniserial. Arista weakly pubescent.



Map 32. Geographic distribution of *F. depressa* (Stein).

Thorax.—As in the male.

Abdomen.—Weakly pollinose, subglossy, entirely dark.

Legs.—F_2 avs. setulose except for two erect stronger subbasally; pvs. setulose except for basal ventral. F_3 with three strong preapical avs. T_3 with three avs., two ads.

Type locality and type

Massachusetts. Type in Chicago Natural History Museum.

Records, 10 ♂♂, 9 ♀♀ (Map 32)

MANITOBA. Brandon, 5 ♀♀. ONTARIO. Ottawa, 1 ♂. QUEBEC. Aylmer, 1 ♀. VERMONT. Mt. Equinox, 1 ♀. MARYLAND. Plummer's Isld., 1 ♂. MISSOURI. Kirkwood, 1 ♂. NORTH CAROLINA. Forney Ridge, Great Smoky Mts. (6000 ft.), 1 ♀; Highlands (3800 ft.), 2 ♀♀. TENNESSEE. Knox Co., 1 ♀. GEORGIA. Mt. Enotah (4782 ft.), 2 ♂♂, 1 ♀; Rabun Co., 2 ♂♂; Kennesaw Mt., Cobb Co., 1 ♂; Dekalb Co., 1 ♂; Blood Mt. (4463 ft.), 1 ♀; Brasstown Bald, 1 ♂.

Collecting dates from April 25 to September 19.

Fannia neomexicana, new species

Figs. 85, 93

This species and its relatives *elongata* and *leucogaster* are most easily recognized by the elongate cercal plate in the male, and by the single strong prealar. From its closest relatives, *neomexicana* is distinguished by the yellow legs, bluish-grey-pollinose abdomen, and long hind-femoral pvs. (as long as femoral diameter). Length 5.0-5.5 mm.

Male

Head.—Frontal bristles six or seven. Parafrontals fairly broad near antenna (0.04 increasing to 0.14 mm.). Occipital bristles moderately long, regular. Second antennal segment and base of third yellowish, arista subpubescent.

Thorax.—Brownish-grey-pollinose, nonvittate. Pra. one, strong. Stigmatal setulae absent. Squamae pale, equal, the lower projecting. Haltere yellow. Wing veins yellow-brown.

Abdomen.—1.6 by 3.4 mm., rather strongly narrowed caudad. Bluish-grey-pollinose, the median vitta triangulated, not broadly expanded along posterior margins.

Legs.—Yellow, only the tarsi black. F_2 avs. with nine strong (as long as femoral width), well-spaced on basal two-thirds, decreasing evenly to preapical comb of nine; pvs. with strong basal, then 10 long on basal three-fourths, partially overlapping preapical comb of six, and weakly duplicated on median third. F_3 avs. with four strong preapicals, short but erect setulae basad, ventral setulae on basal two-thirds; pvs. long (equal to femoral diameter), fine on basal four-fifths, short setulose to apex. T_3 with three or four long hairlike avs., one ad., pds. suberect at two-thirds from base.

Hypopygium.—Cercal plate moderately slender, elongate. Surstylus laterally flattened, with an arcuate dorsal outline, and with seven or eight ventral bristles situated toward the apical half. Bacilliform process slender, distinctly spiralled. Fifth sternum emarginate apically without lateral projections, bristles scattered.

Female

Head.—Parafrontals grey-brown-pollinose, one-third as broad as long, setulae irregularly biserial. Second antennal segment and arista yellowish.

Thorax.—Grey-brown-pollinose, with faint brown vittae, bristled as in the male.

Abdomen.—Basally faintly yellowish, remainder grey-brown-pollinose, subshining.

Legs.—Yellow, only the tarsi black. F_2 avs. setulose with two erect, stronger at one-third; pvs. with basal distinct, remainder setulose. F_3 with two or three strong widespaced preapical avs. T_3 with two or three avs., one ad.

Types

Holotype.—♂, Magdalena, New Mexico (no other data) (F. H. Snow?). (Snow Entomological Museum).

Allotype.—♀, same data (Map 33).

Fannia leucogaster, new species

Figs. 86, 92

This species is obviously closely related to *neomexicana*, with very similar bristling. However the abdominal pattern (closely resembling that of *canicularis* with basal segments yellowish) and golden-brown-pollinose thorax are distinguishing features for the species. Length 5.0-5.5 mm.

Male

Head.—Frontal bristles seven to 10. Parafrontals moderately broadened toward antennae (0.04 increasing to 0.09 mm.). Occipital bristles short and regular. Second antennal segment at most reddish-tinged apically, third segment black.

Thorax.—Medium golden-brown, pleurae grey. Bristling and squamae as described for *neomexicana.*

Abdomen.—1.6 by 3.4 mm. Marked as in *canicularis,* the median vitta strongly triangulated, lateral areas of second to fourth segments yellow, fifth segment dark-pollinose.

Legs.—Yellow to reddish-brown, femora more or less infuscated, tarsi black. F_2 bristled as in *neomexicana,* pvs. more strongly duplicated on median third. T_2 and T_3 as in *neomexicana.* F_3 as in *neomexicana* but ventrals and pvs. weaker, at most two-thirds femoral width.

Hypopygium.—Very similar to that of *neomexicana,* but cercal plate broader, and surstylus more regular in dorsal outline, weakly expanded on basal half, with ventral bristles more toward the base.

Female

Unknown.

Types

Holotype.—♂, Logan Canyon, Utah, 15.VIII.1937 (Knowlton and Harmston) (C.N.C. No. 6669).

Paratypes.—5 ♂♂, as follows: UTAH. 1 ♂, same data as type; 1 ♂, Logan Canyon (8500 ft.), Wasatch Mts., 25.VII.1940 (D. G. Hall); 1 ♂, S. Fork, Ogden R., 21.VIII.1942 (Knowlton and Wood). OREGON. 1 ♂, Summit Prairie, 23.VII.1939 (Schuh and Gray). IDAHO. 1 ♂, Franklin, 30.VIII.1953 (G. F. Knowlton). (Map 33).

Fannia elongata, new species

Figs. 87, 94

This species is very closely related to the preceding two, probably most closely to *leucogaster,* differing in being very dark and distinctly more hirsute. Length 4.8 mm.

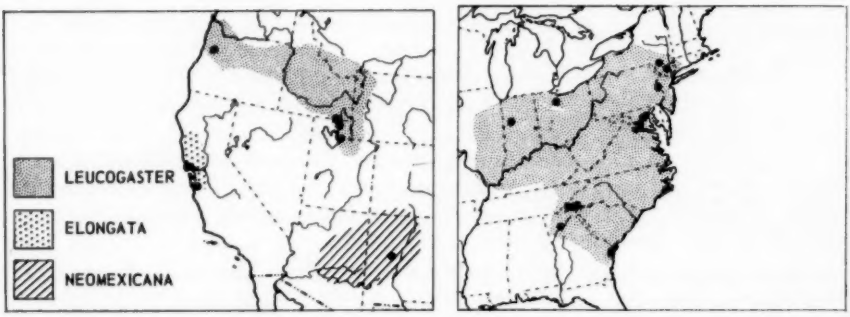
Male

Head.—Frontal bristles nine, with several interstitials anteriorly. Parafrontals moderately broadened toward antennae. Occipital bristles short, regular. Antenna completely black, arista thickened basad.

Thorax.—Deep brownish-black, with faint traces of greyish pollen along the dorsocentral rows. Accessory setulae long, numerous; intraalars at least two-rowed, extending almost to single prealar (unique). Stigmatal setulae about five. Squamae and haltere as in *neomexicana.* Wing veins dark brown.

Abdomen.—1.6 by 3.9 mm. Black, completely bluish-grey-pollinose, the median vitta strongly triangulated, extending broadly across the posterior margins of the segments.

Legs.—Entirely black, not even the knees yellowish. F_2 avs. about 20, gradually changing from long basal to short close-set preapical comb; pvs. also numerous and strong, evenly decreasing apicad, strongly duplicated ventrally on median third. T_2 as described for *neomexicana.* F_3 avs. distinctly erect, changing evenly apicad to five or six strong preapicals; pvs. rather long, increasing until equal to femoral diameter preapically. T_3 with two avs., the lower much weaker; one ad.; two distinct suberect pd. setulae below the upper dorsal bristle.



Maps 33-34. Geographic distributions of *Fannia* spp. 33, *leucogaster* complex. 34, *curvipes* Mall.

Hypopygium.—Similar to that of *mexicana*, but the cercal plate more elongate and slender, the surstylus more slender and less flattened, and the bacilliform process weaker.

Female

Unknown.

Types

Holotype.— ♂, Stanford University, California (hovering in shade of *Pinus radiata*), 11.IV.1906 (J. M. Aldrich) (U.S.N.M. No. 64279).

Paratypes.—2 ♂ ♂, same data as holotype; 1 ♂, Black Point, Marin Co., California, 14.IV.1954 (A. D. Telford). (Map 33).

***Fannia curvipes* Malloch**

Figs. 88, 95, 193, 287

Fannia curvipes Malloch, 1924a, p. 421; Curran, 1930, p. 87.

This species is very striking in appearance, and is easily recognized by the yellow legs with the strongly curved and preapically enlarged hind femora, with a long strong bristle cluster on the swelling. In both sexes the complete lack of any bristle on the prealar surface is a distinguishing feature. Its closest relatives are probably the European *fasciculata* Loew, and more distantly the Mexican species *arcuata*. Length 5.8 mm.

Male

Head.—Frontal bristles seven or eight, fine and short. Parafrontals narrow, scarcely broadening apicad (0.05 increasing to 0.10 mm.). Occipital bristles short and regular. Second antennal segment yellow-brown, third clear yellow; arista distinctly pubescent.

Thorax.—Bluish-brown, sparsely pollinose, nonvittate, the scutellum brown-pollinose. Acr. evenly triserial. Pra. completely absent. Stigmatal setulae about five. Squamae subequal, the lower slightly longer and distinctly projecting whitish, margins pale yellow. Haltere pale yellow. Wing veins yellow.

Abdomen.—1.8 by 3.0 mm. First segment dark, next three largely yellow with a narrowly triangulated brown median vitta. Fourth yellowed on basal half; apical half and all of fifth segment blue-grey-pollinose.

Legs.—Yellow, except for black tarsi and infuscated coxae. F_2 avs. with three or four weak on basal three-eighths, then five stronger and closer-set, as long as femoral diameter, followed by a comb of about 10 short strong bristles, preapically bare; pvs. with a strong basal, followed by bristles finer but as long as avs., apical half with six short bristles in a tight clump; ventral setulae sparse. T_2 with a rounded enlargement on basal three-eighths, then narrowed and flattened medially, enlarging again on apical half to twice basal diameter; mat short and single-rowed on basal half (thickened on basal enlargement), longer and denser on apical half. F_3 circular in cross-section on basal half, flattened dorsoventrally on apical half, preapically enlarged in a distinct swelling; avs. with erect bristles three-fourths as long as femoral diameter on basal three-fourths, strengthening to four long preapical bristles almost twice femoral diameter; ventrals and pvs. setulose on basal fourth, absent medially, then a preapical pv. cluster of about 20 on the preapical swelling, the longest of these three times femoral diameter and apically curled. T_3 with three or four long (twice tibial diameter) bristles, one ad.

Hypopygium.—Cercal plate very slender on apical half and prolonged into an upcurved process. Surstylus very long and slender, slightly arcuate on apical half. Bacilliform process absent. Fifth sternum broader than long, rather broadly emarginate apically, with a median marginal area weakly sclerotized and with numerous fine setulae, other bristles numerous and rather scattered.

Female

Head.—Parafrontals grey-pollinose, narrow, one-fifth as broad as long; setulae weak, in an even row. Antenna yellow, arista pubescent.

Thorax.—As in the male.

Abdomen.—Evenly yellow, weakly pollinose.

Legs.—Yellow, tarsi black. F_2 avs. and pvs. setulose. F_3 with two widespread preapical avs. strong, basally setulose. T_3 with two avs., one ad.

Larva (Fig. 287)

Integument weakly reticulate, the interspaces margined with short oblong tubercles. Laterodorsal processes short and only minutely branched, those on caudal segment two-thirds as long as caudal segment and bearing about seven pairs of broad bifurcate projections, apical third of process almost bare; lateroventral processes absent except on caudal segment; dorsolateral processes absent; dorsal processes short and unbranched. Cephalic process of first thoracic segment short, lateral process absent. Anterior spiracular processes distinct but short, about ten in number. Posterior spiracular stalk short, spiracular processes short, radially arranged, not fused together.

Based on several third-instar larvae and puparia from oak-leaf litter at Wayah Gap, near Franklin, North Carolina.

Type locality and type

Glen Echo, Maryland. Type in U.S. National Museum.

Remarks

The species was collected in some numbers in mixed deciduous forest in North Carolina, and a colony of larvae was collected and reared from a Berlese sample taken from oak-leaf litter at 4000 ft.

Records, 20 ♂♂, 51 ♀♀ (Map 34)

NEW YORK. Tuxedo (Harriman Interstate Park), 2 ♂♂, 1 ♀; Montgomery, 1 ♂. PENNSYLVANIA. Lehigh Gap, 2 ♀♀. OHIO. Ira, 1 ♂, 1 ♀. INDIANA. Lafayette, 1 ♂, 1 ♀. MARYLAND. Glen Echo, 2 ♂♂, 19 ♀♀ (type series); Cabin John, 1 ♀ (Paratype); Baltimore, 1 ♀; Gunpowder R., Baltimore Co., 1 ♀. VIRGINIA. Langley, 1 ♀; Dead Run, Fairfax Co., 1 ♂; Greenlee, 1 ♀. NORTH CAROLINA. Franklin, 1 ♂; Highlands (3800 ft.), 2 ♂♂, 2 ♀♀; Wayah Bald (5300 ft.), 2 ♀♀; Base of Wayah Bald, 1 ♀; Wayah Gap (4000 ft.), 8 ♂♂, 13 ♀♀ (with puparia); Rich Mt. (2000 ft.), Jackson Co., 1 ♀. GEORGIA. Neel Gap, 1 ♀; Clayton, 1 ♀; Brasstown Bald, 1 ♀; Rabun Co., 1 ♀.

Collecting dates from June 10 to August 10.

Fannia arcuata, new species

Figs. 89, 96, 192, 288

This species is rather distantly related to *curvipes;* it has rather similar male genitalic and leg structure, but quite different coloration and bristling. It is easily recognized by the full postoccipital row, elongated dark-pollinose abdomen, and arcuate legs. Length 6.0-6.5 mm.

Male

Head.—Frontal bristles 11 or 12, strong, with a few interstitials. Parafrontals broadening apicad (0.06 increasing 0.15 mm.), separated by a distinct broad frontal vitta (0.08 mm. at narrowest). Postoccipital bristles present and extending almost to verticals. Occipital bristles somewhat longer and irregular dorsad. Antenna black, arista weakly pubescent. Proboscis and palpus somewhat elongate, theca rather strongly sclerotized.

Thorax.—Dark-greyish-brown-pollinose. Acr. triserial, somewhat quadriserial postsuturally. Accessory setulae numerous, rather long, intraalars weakly triserial. Pra. 2, the posterior one weaker. Scutellar disc moderately setulose. Mesopleurals numerous. Stigmatal setulae 12 to 15. Squamae large, equal, pale whitish-yellow, lower distinctly projecting. Haltere medium yellow. Wing veins dark, membrane distinctly infuscated.

Abdomen.—Fairly elongate, 1.6 by 3.9 mm. Dark-blue-grey-pollinose, the median vitta largely obscured, appearing almost linear.

Legs.—Black, at most the foreknees yellowish. F_2 avs. very strong, basally 1.5 times femoral diameter, decreasing evenly on basal three-fifths to as long as femoral diameter, then rapidly reduced to one-third femoral diameter, and then preapically stronger (two-thirds femoral diameter); pvs. with no distinct basal, longer and finer than avs., not differentiated apicad; ventrally with a row of fine bristles on basal three-fourths. T_2 much as in *curvipes,* but more strongly deformed, the basal enlargement twice narrowest diameter and the preapical half curving outward; two ads., one pd. F_3 strongly dorsoventrally flattened throughout, but with a preapical swelling as in *curvipes;* avs. very strong on basal three-fourths (twice as long as femoral diameter), absent on preapical swelling except for one strong bristle; ventral surface with scattered setulose hairs; pvs. fine, hairlike basad (as long as femoral diameter), changing abruptly on the preapical swelling to five strong curled bristles. T_3 avs. three to five, anterior and ad. strong; no erect posterior setulae.

Hypopygium.—Cercal plate slender, not elongate. Surstylus elongate, suddenly tapering medially and gradually expanding again on apical portion, with a median outer spur. Bacilliform process long, slender and rod-like. Fifth

sternum strongly emarginate apically with broad lateral projections, bristles crowded marginally.

Female

Head.—Parafrontals grey-pollinose, one-third as broad as long, setulae irregularly biserial. Frontal bristles usually six. Postoccipital row weak dorsad. Palpus weakly spatulate; theca subpollinose, rigid.

Thorax.—As in the male.

Abdomen.—Evenly subshining, dark-grey-pollinose.

Legs.—F_2 avs. with three or four erect on basal half, rest setulose; pvs. setulose. F_3 avs. setulose with two widely spaced preapical avs. T_3 with two avs., one ad.

Larva (Fig. 288)

Integument at most very weakly reticulate, distinctly granulate, granules small and rather sparse but tending to outline polygonal areas as in *curvipes*. Laterodorsal processes long and strong from second thoracic segment, bearing about seven pairs of broad, apically trifurcate projections on basal half; lateroventral processes distinct, about one-third as long as laterodorsals, and bearing only a few basal lateral bifurcate projections; dorsolateral processes distinct, with three or four pairs of weak bifurcate projections; dorsal processes short but bearing about five weak simple projections. Cephalic process of first thoracic segment long and slender, lateral process short and weak. Anterior spiracular processes distinct but short, about ten in number. Posterior spiracular stalk short, spiracular processes scarcely evident, pores radially arranged.

Description based on a single third instar larva collected from a malt trap near Mexico City, Mexico; and tentatively referred to this species on distributional data, and similarity to *curvipes*.

Type

Holotype.— ♂, Coapa, D. F., Mexico, 26.VIII.1922 (E. G. Smyth) (U.S.N.M. No. 64280).

Allotype.— ♀, same data (U.S.N.M.).

Paratypes.—4 ♂♂, same data. 1 ♀, 23 mi. S. of Toluca, Mexico, Mexico (7700 ft.), 9.VIII.1954 (J. G. Chillcott); 1 ♂, Mexico City, Mexico, Mexico (Juan Mulier).

***Fannia gilvitarsis*, new species**

This species is very closely related to *arcuata*, but the yellow front tarsus and reduced hind-tibial bristles are distinctive. Length 6.5 mm.

Male

Differs from *arcuata* as follows:

Head.—Frontal vitta slightly more narrow (0.05 mm. at narrowest). Postoccipital bristles ceasing well before verticals. Theca only moderately sclerotized.

Thorax.—Dark bluish-brown-pollinose. Acr. evenly triserial. Accessory setulae less numerous, intraalars long but uniserial.

Abdomen.—Proportioned as in *arcuata*, 1.8 by 3.3 mm.

Legs.—Black, including knees, except for pale yellow front tarsus of which only apex of fifth segment is darkened. Preapical portion of T_2 not curved

outward. F_8 not strongly flattened dorsoventrally, preapical swelling faint; avs. strong on basal two-thirds, absent on swollen portion, with one strong preapical; pvs. long and hairlike basad, becoming increasingly longer apicad, with two to four strong bristles preapically on swollen portion. T_8 avs. two, ads. one, preapical dorsal weak, no erect posterior setulae.

Hypopygium.—Very similar to that of *arcuata*, surstylus tapering more evenly and less strongly swollen apically, outer spur only indicated. Bacilliform process slightly curved ventrally.

Female

Unknown.

Type

Holotype.— ♂, 4 mi. W. Rio Frio (9800 ft.), Mexico, Mexico, 14.VII.1953 (University of Kansas Mexican Expedition) (Snow Entomological Museum).

benjamini Group

This is a group that is poorly represented in the Nearctic region, but predominant in the Neotropical region. It is treated here, because of this paucity of representation, as a single group, although there are evidently several distinct groups involved. The *benjamini* subgroup is represented by several species in the southwestern United States, while *setifer* has several close South American relatives such as *punctipennis*, *inermipennis*, and *bahiensis*. *F. clavata* and *micheneri* are closely related, respectively, to *grandis* and *vittata* described from Panama, and to several other South American forms.

The group as a whole is characterized by yellowish antennae and palpi (the palpi often spatulate); usually vittate thorax with lateral spots or a band at the base of the scutellum brown; abdomen yellowish with the median vitta broadly triangulated with lateral dark-yellow spots, or linear with lateral brown-pollinose spots; hind femur regular in shape or apically swollen, frequently with a preapical posteroventral bristle clump. Hind tibia with two to six avs., and one ad.

The *benjamini* subgroup has the thoracic vittae along the bristle rows or absent, acrostical bristles evenly triserial, hind femur normal or with faint preapical posteroventral tubercle, posteroventral cluster loose to compact, hind tibia with two anteroventrals, abdomen with linear vitta and lateral pollinose spots. The females have parafacial setulae and two spermathecae.

The *setifer* subgroup (based on *setifer* and Albuquerque's descriptions of South American forms) has the thoracic vittae farther apart, the lateral vittae largely outside dorsocentral bristle rows, acr. tending to be quadriserial postsuturally, hind femur as in the *benjamini* subgroup, hind tibia with usually four anteroventrals, lower squama elongate-triangular, abdomen with triangulated vitta and lateral dark-yellow spots (the vitta slightly expanded on posterior margins behind the spots). Females with bare parafacials and two spermathecae.

The *vittata* subgroup is fairly close to the preceding, but the thorax has five vittae, one along median acrostical row, and one on each side of the dorsocentral bristle row; the hind femur is variable from normal to strongly clavate, and the hind tibia has three or four avs. and two to seven ads. In addition, the midtibial mat is setulose and scarcely apparent.

Full group description as follows:

Male

Head.—Frontal bristles eight to 12, regular or irregular. Parafrontals broad to narrow, usually distinctly broadened apically, separated by a distinct but narrow frontal vitta. Parafacials bare or with a full row of setulae. Occipital bristles short and regular. Postoccipital bristles absent. Basal antennal segments yellow to reddish; second segment with a single strong bristle, third segment twice as long as broad, yellow to dark brown (usually pale basally). Arista yellowish basad, scarcely enlarged at base, weakly pubescent. Palpus yellow to brown, weakly to strongly spatulate, theca normal.

Thorax.—Ash-grey to yellowish-grey (rarely brown-pollinose) with usually three to five distinct brown vittae; scutellum basally brown, apically yellowish-pollinose. Acr. bristles evenly triserial or irregularly quadriserial postsuturally. Accessory setulae sparse to moderately numerous. Prealars represented by a few strong setulae, never distinctly bristlelike, rarely absent. Stigmatal setulae two to six (probably ranges from none to many). Mesopleural bristling variable, dorsal row scarcely or distinctly stronger. Scutellum normal. Squamae with the lower equal to or much longer than the upper. Squamae and haltere yellow, wing clear.

Abdomen.—Two-fifths to three-fifths as long as broad. Basal segments more or less translucent yellow, partially obscured by brownish-grey pollen. Median vitta narrowly triangulated with posterior margins of segments dark-pollinose, often expanded into lateral spots more or less distinct from margin; or with dark-yellow lateral spots in the same position.

Legs.—Variable in color, tarsi black. F_1 pvs. variable. T_1 sometimes with weak ad., usually without median bristles. F_2 avs. usually weak on basal half, a few stronger medially, then a strong comb on apical third; pvs. with usually a strong basal, then several strong on basal half, followed by several closer-set and somewhat doubled, and a preapical comb which often trends onto posterior surface; ventrally with a partial to complete row next to the pvs. T_2 evenly thickened to apex, apically at most 1.5 times basal diameter; ventral mat well-developed or sparse-setulose, the setulae semiprostrate; medially with one ad., one p. Mt_2 without basal crest. C_3 with one to eight posterior bristles. F_3 variable from normal to strongly clavate (not to my knowledge ever arcuate); avs. with two to four preapical bristles, on basal half variable from prostrate to distinct, erect setulae; pvs. basally fine, apically forming a more or less distinct clump (rarely an even row), often the long preapical bristles on a faint swelling. T_3 with two to seven avs., one to four ads., no pvs.

Hypopygium.—Cercal plate usually simple, divided basally and strongly fused apically, not or scarcely elongated, bristling weak. *F. clavata* is aberrant in that the plate is fully fused, slightly elongate with two preapical ventral processes. Surstylus broad and simple with a deep curving groove on basal portion, or strongly expanded on preapical half to form a broad claw-shaped structure; main portion of surstylus arising medially or slightly laterally. Ninth sternum normally weakly developed, normally without processes and with membranous aedeagus, but in *clavata* with a submedian pair of blunt flap-like processes. Bacilliform process weakly to strongly spiralled. Fifth sternum as broad as or distinctly broader than long, bristles moderately crowded posteriad in the *setifer* subgroup, more strongly so in *clavata*, in the *benjamini* subgroup the bristles reduced and set irregularly in a semicircular, weakly sclerotized band.

Female

The females are known for only a few species, all of the *benjamini* subgroup. For a detailed description see the description of *benjamini* and the comparative notes under the others.

Larva

Also known for only two species, both of the *benjamini* subgroup. The following description is thus probably only valid for this subgroup.

Integument granulate, granules scattered, not forming distinct lines nor outlining polygonal areas. Laterodorsal processes strong, with weak, simple, lateral projections on at most basal fourth, sublateral process on caudal segment distinctly shorter than other two; lateroventral processes short and simple, not more than half as long as laterodorsals, absent on caudal segment; dorsolateral processes weak to absent; dorsal processes weak, simple, and inconspicuous. Cephalic process of first thoracic segment short. Anterior spiracular processes distinct, three in number. Posterior spiracular stalk situated laterally but slightly in from margin, elongate and slender, the spiracular processes strongly fused with stalk, almost parallel. Mouth hooks well developed.

Description based on single puparia of *neotomaria* and *benjamini*.

benjamini subgroup
Fannia benjamini Malloch

Figs. 97, 103, 194, 253, 289

Fannia benjamini Malloch, 1913, p. 625, Fig. 9; Malloch, 1918, p. 292; Malloch, 1924a, p. 419; Malloch, 1924b, p. 516, 518; Burnett et al., 1957, p. 433.

This species is the only common North American member of this group and is easily distinguished from its relatives by the brown-pollinose, nonvittate thorax and dark-colored abdomen. Except for the yellow antennae, palpi, and tibiae, this species could be easily mistaken for a member of the *pusio* subgroup, to which it is quite unrelated. Length 3.5-4.5 mm.

Male

Head.—Frontal bristles nine, fairly strong and regular. Parafrontals narrow (0.03 increasing to 0.07 mm.), silvery. Parafacials narrow, without setulae. Postoccipital bristles present on lower third. Third antennal segment brownish-black, arista black. Palpus yellow or brownish-yellow, weakly spatulate.

Thorax.—Evenly brown-pollinose, nonvittate, scutellum concolorous. Acr. evenly triserial. Accessory setulae sparse. Pra. as one or two strong short setulae. Stigmatal setulae absent. Mesopleurals distinctly stronger anterodorsally. Squamae pale with margin brownish, the lower slightly larger and distinctly projecting.

Abdomen.—1.6 by 2.2 mm. Usually fully pollinose, without any trace of yellow translucence. Pearl-grey-pollinose with medium-brown-pollinose markings. Seen from behind, markings appearing as a linear median vitta and a lateral pair of broad spots more or less confluent at posterior margin.

Legs.—Legs yellow, except for black tarsi and more or less infuscated femora. T_1 with no median bristles. F_1 pvs. weak on basal third. F_2 avs. with four weak and setulose on basal third, then four or five stronger on median third, followed by a tight comb of 16 to 20 shorter bristles to apex; pvs. with a partially doubled row of weak bristles on basal half, then about six stronger to three-

quarters, and a close-set preapical comb of six to 10 bristles, the comb tending slightly posterodorsally. T_2 with ventral mat reduced to a uniserial row of erect setulae on apical half. C_3 with one or two bristlelike setulae. F_3 (see Fig. 194) normal, avs. setulose except for two widespread preapicals, pvs. setulose except for a cluster of about seven long hairlike bristles on a slight elevation at two-thirds. T_3 with two avs., one ad.

Hypopygium.—Cercal plate well separated basally. Surstylus broad and flat, rather parallel-sided. Bacilliform process moderately spiralled. Fifth sternum broad basally, with weak bristles set on a semicircular, weakly sclerotized band at the posterior edge.

Female

Much paler than the male.

Head.—Parafrontals brownish-grey-pollinose, about as wide as frontal vitta and convex on inner margin. Setulae uniserial, extending down onto parafacials well below aristal base. Palpus bright yellow, distinctly spatulate. Otherwise as in the male.

Thorax.—Distinctly grey-pollinose, with three narrow brown vittae along acr. and dsc. rows, and irregular brown markings around intraalar row. Scutellum with two brown spots subbasally. Squamae with concolorous margins.

Abdomen.—Blue-grey-pollinose, not or scarcely yellowish basad, with a discontinuous median vitta and irregular lateral spots brown.

Legs.—Usually more yellowish than in the male. F_1 pvs. evenly decreasing to base. F_2 avs. and pvs. with weak suberect setulae. T_2 medially with one av., one ad., one pd., all about equal to tibial diameter, zero to two weak pvs. F_3 avs. and pvs. setulose except for two stronger preapical avs.

Larva (Fig. 289)

Integument moderately granulate, not becoming tuberculate at anterior margins of segments. Laterodorsal processes of caudal segment with two or three pairs of basal projections which are at least as long as basal diameter of process; lateroventral processes long and slender. Cephalic process of first thoracic segment short. Posterior spiracular stalk slender.

Description based on a single puparium from a *Neotoma* nest at San José, Baja California.

Type locality and type

Mountains nr. Claremont, California. Type in U.S. National Museum No. 15425.

Remarks

Habits.—There are several records of this species being very bothersome, persisting in entering ears, nostrils, and eyes, apparently attracted by mucus. The species is common in California along streams in oak groves at 4500 ft., and has been implicated as a vector of a mammalian eye worm, *Thelazia californiensis* Price (Burnett et al., 1957).

Records, 7 ♂♂, 220 ♀♀ (Map 35)

CALIFORNIA. Mts. near Claremont, 1 ♂, 5 ♀♀ (type series); Santa Clara Co., 1 ♂; Santa Monica Mts., Los Angeles Co., 37 ♀♀; Elizabeth Lake Canyon, 3 ♀♀; Pacific Palisades, L.A. Co., 2 ♀♀; Beverly Glen, L.A. Co., 8 ♀♀; Tanbark Flat, L.A. Co., 12 ♀♀; Topanga Canyon, L.A. Co., 6 ♀♀; San Dimas

Canyon, L.A. Co., 16 ♀♀; Tapia Park, L.A. Co., 1 ♀; Los Angeles Co., 1 ♀; Lake Arrowhead, San Bernardino Co., 2 ♀♀; Moronga Valley, S.B. Co., 2 ♀♀; Andreas Canyon, Riverside Co., 1 ♀; Dos Palmas, Riverside Co., 14 ♀♀; Temecula, Riverside Co., 1 ♂, 3 ♀♀; White Water Canyon, Riverside Co., 2 ♀♀; Big Dalton Canyon, Riverside Co., 4 ♀♀; Keen Camp, Riverside Co., 1 ♀; Stone Canyon, Monterey Co., 2 ♂♂; San Jacinto Mts., 1 ♂, 15 ♀♀; Marion Mt. Camp, San Jacinto Mts., 1 ♀; Hemet Reservoir, San Jacinto Mts., 1 ♀; Berkeley, 3 ♀♀; San Diego, 1 ♀; Alpine Inn, Mt. Lowe (5000 ft.), 1 ♀; Mt. Lowe, 3 ♀♀; Yosemite, 1 ♀; Newman, San Joaquin R., 1 ♀; San Mateo, 1 ♀; Mesa Grande, Sonoma Co., 1 ♀; Frazier Park, Kern Co., 1 ♀; Frazier Mt., Kern Co., 3 ♀♀; Pasadena, 1 ♀; Laguna Mts., 1 ♀; Alpine, 3 ♀♀; Orange Co., 1 ♀; Idyllwild, 1 ♀; Cuyamaca Lake, 2 ♀♀; Mt. Springs, 3 ♀♀; Arroyo Seco E., 1 ♀; Marin Co., 1 ♀; Santa Cruz Mt., 1 ♀; Indio, 1 ♀; Sequel (in redwoods), 2 ♀♀; Santa Barbara, 1 ♀; San Gabriel R., 1 ♀; Mt. Hermon, Santa Cruz Co., 1 ♀; Lafayette, Conta Costa Co., 2 ♀♀; Ravine Rd., Los Gatos, 5 ♀♀; Castro Valley, Alameda Co., 2 ♀♀; Saratoga, 1 ♀; Lexington Reservoir, Santa Clara Co., 2 ♀♀; Mt. Diablo, 1 ♀; Glendale, 2 ♀♀; San Luis Key Camp, San Diego Co., 1 ♀; Warner Springs, San Diego Co., 1 ♀; Stauffer, Ventura Co., 1 ♀; Lane's Redwood Camp, 5 ♀♀. NEVADA. Overton, 1 ♀. UTAH. Stansbury Isl., Tooele Co., 5 ♀♀; Silver Lake, 1 ♀. COLORADO. Macedonia, 3 ♀♀. WYOMING. Cody, 1 ♀; 40 m. N. of Lusk, 1 ♀. IDAHO. Carey, 1 ♀. ARIZONA. Doney, 5 ♀♀; Graham Mts., 1 ♀; Douglas, 1 ♀; Turkey Tanks, 1 ♀. TEXAS. Brownsville, 3 ♀♀; Round Mt., 1 ♀. MEXICO. San José, Baja California, 1 ♂, 1 ♀ (male reared from *Neotoma* nest material).

Collecting dates from April 21 to November 6.

***Fannia conspicua* Malloch**

Figs. 100, 106, 255

Fannia conspicua Malloch, 1913, p. 624; Malloch, 1924a, p. 419.

This species and the rest of the subgroup are separable from each other almost solely on the basis of the male hind-femoral bristling, and can be separated from *benjamini* by the distinctly pale, vittate thorax and basally yellowed abdomen. The median cluster of hind-femoral anteroventral bristles separates this species from all but *neotomaria*, which has these bristles much shorter and finer. Length 3.5 to 4.5 mm.

Male

Head.—Frontal bristles nine, regular. Parafrontals broader (0.04 increasing to 0.10 mm.), silvery. Parafacials narrow, without setulae. Postoccipital bristles absent. Third antennal segment yellowed on basal fourth, brownish-black apically, arista basally yellow. Palpus yellow, weakly spatulate.

Thorax.—Greyish-brown, with three indistinct brown vittae along the bristle rows. Scutellum grey-pollinose, with a pair of small, lateral, brown spots basally. Otherwise as described for *benjamini*.

Abdomen.—1.6 by 2.2 mm. Basal abdominal segments distinctly translucent yellow laterally, the whitish pollen reduced on these areas. Median vitta linear, brown, with lateral, marginal dark-brown-pollinose spots on each segment, markings reduced on fifth.

Legs.—Coloration, F_1 and F_2 as described for *benjamini*. T_2 with ventral mat biserial, half tibial diameter and curled apically to one-half, then stronger and as long as tibial diameter to apex. C_3 as described for *benjamini*. F_3 avs.

setulose basad, then four to six stronger at one-half, and one strong preapical; pvs. absent except for about 12 fine and three or four strong (at least as long as femoral diameter) bristles on median third.

Hypopygium.—Similar to that of *benjamini*, but the surstylus basally broadened, and the bacilliform process thicker.

Female

Not known.

Type locality and type

Williams, Arizona. Type in U.S. National Museum, No. 15424.

Records (Map 36)

1 ♂, Tempe, Arizona, 12.IV.1938 (sacate trap) (C. C. Deonier) Bishopp No. 27817.

***Fannia neotomaria*, new species**

Figs. 252, 278

This species is very close to *conspicua*, but can be recognized by the grey-pollinose thorax, which bears three narrow brown vittae, and by the weak hind-femoral posteroventral bristle cluster. From others of the *benjamini* subgroup it can be recognized by the median cluster of hind-femoral anteroventrals. Length 3.8 mm.

Male

Head.—As described for *conspicua.*

Thorax.—Bluish-grey-pollinose, with three narrow brown vittae along the bristle rows, the dorsocentral vittae appearing as spots around the bristle sockets, weakly connected to each other. Scutellum concolorous, with two small latero-basal brown spots. Bristling as described for *benjamini.*

Abdomen.—1.4 by 1.8 mm. Color and pollinosity as described for *conspicua.*

Legs.—F_1 and F_2 as described for *benjamini.* T_2 with ventral mat uniserial on basal half, irregularly biserial on apical half, never more than half tibial diameter where situated. C_3 as described for *benjamini.* F_3 with avs. setulose on basal half, then four to six stronger but rarely as long as femoral diameter on median part, then two or three setulae and a strong preapical; pvs. absent except for about 12 fine (never as long as femoral diameter) bristles on median third.

Hypopygium.—Not studied.

Female

Not known with certainty.

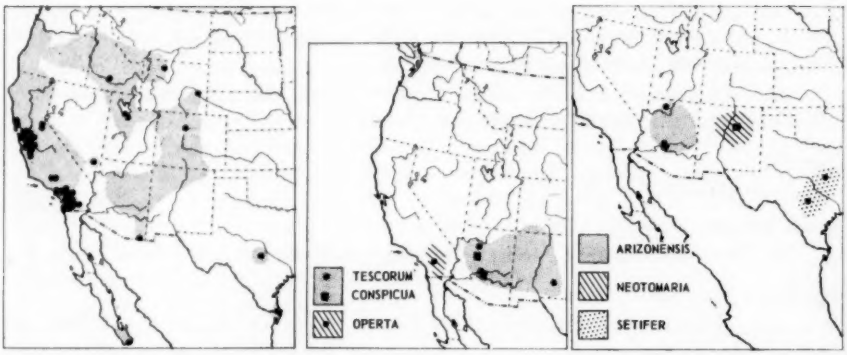
Larva (Fig. 278)

Integument sparsely granulate, becoming tuberculate at anterior margins of segments. Laterodorsal processes of caudal segment with only a few irregular and very short basal projections; lateroventral processes short. Cephalic process of first thoracic segment elongate. Posterior spiracular stalk stout.

Description based on a single puparium from nest of *Neotoma albigula* in Santa Fe Co., New Mexico.

Type

Holotype.— ♂, Santa Fe Co., New Mexico, reared from nest of *Neotoma albigula*, coll. 18.XI.1951, emerged 10.XII.1952 (H. B. Morlan) (U.S.N.M. No. 64281). (Map 37).



Maps 35-37. Geographic distributions of *Fannia* spp. 35, *benjamini* Mall. 36, *tescorum* Chill., *conspicua* Mall., and *operta* Chill. 37, *arizonensis* Chill., *neotomaria* Chill., and *setifer* Chill.

Fannia operta, new species

Fig. 256

This species is obviously closely related to the other species of the group, but can be easily recognized by the presence of four strong hind-femoral anteroventrals on the apical half. Length 4.2 mm.

Male

Head.—As described for *conspicua* except that the parafrontals are narrower (0.03 increasing to 0.09 mm.).

Thorax.—Badly greased, so that the markings are not visible.

Abdomen.—Rather broad, 1.5 by 1.7 mm. Second and third segments translucent yellow on the basal half. Otherwise marked as described for *conspicua.*

Legs.—Dark, all femora entirely infuscated, tibiae reddish-yellow. Front and mid legs as described for *neotomaria.* C_3 with one or two pv. setulae. F_3 with avs. setulose basally, but with four strong avs. on apical half; pvs. with a clump of four to six fine bristles at three-fourths, these bristles as long as the avs.

Hypopygium.—Not studied.

Female

Head.—As described for *benjamini,* but the parafrontals more brownish.

Thorax.—Dark greyish-brown, the vittae and scutellar spots scarcely distinct.

Abdomen.—As described for *benjamini.*

Legs.—Dark, the femora largely infuscated, tibiae reddish. Bristling as described for *benjamini.*

Types

Holotype.—♂, The Gavilan, Riverside Co., California, 17.V.1951 (E. I. Schlinger). (University of California at Davis).

Allotype.—♀, same data.

Paratypes.—3 ♀ ♀, same data. (Map 36).

Fannia arizonensis, new species

Figs. 98, 104, 195, 257

This species is fairly close to *benjamini* and *tescorum,* with only two preapical hind-femoral anteroventrals; but can be distinguished from these two by

the posteroventral bristle clump which consists of four to six fine bristles, at most one of which is distinctly longer than femoral diameter, with a number of short setulae extending basad on the posterior surface. Length 3.5-4.5 mm.

Male

Head.—Frontal bristles nine, regular. Parafrontals silvery, narrow (0.03 increasing to 0.07 mm.). Parafacials narrow, bare. Postoccipital setulae present on lower third. Antennae yellowish except for the apical two-thirds of the third segment. Arista basally yellow. Palpus yellow, subspatulate.

Thorax.—Brownish-grey-pollinose, the median vitta fairly broad, the lateral vittae narrow and broken, a pair of faint postsutural vittae present outside the dorsocentral row. Scutellum concolorous, with distinct laterobasal spots. Bristling and squamal characters as described for *benjamini*.

Abdomen.—1.4 by 2.2 mm. Second and third segments translucent yellow on basal half, the yellow often obscured by the brownish-grey pollen. Median vitta brown, linear, distinct except on fifth segment. Lateral spots small, distinctly separated from the margin by grey pollen; indistinct on fifth.

Legs.—Fore and mid legs as described for *benjamini*. C_3 with one or two pv. setulae. F_3 with two (rarely three) strong preapical avs., basally setulose; pvs. with four or five long slender bristles at two-thirds in a loose clump extending basad along the posterior surface as slender erect setulae.

Hypopygium.—Very similar to that of *benjamini*, but the surstylus long and slender with a basal ventral swelling.

Female

Very similar to *benjamini*, differing as follows: Third antennal segment and arista yellow at base. Thoracic vittae less distinct, the lateral vittae appearing only as spots around the bristle sockets. Scutellar spots small and faint. Yellow integumental color quite distinct laterally on basal half of second to fourth segments of the abdomen. F_2 avs. and pvs. suberect and setulose, the avs. distinctly stronger. T_2 median bristles shorter than tibial diameter.

Types

Holotype.— ♂, Tempe, Arizona, 12.IV.1938 (in sacate trap) (C.C. Deonier), Bishopp No. 27817 (U.S.N.M. No. 64282).

Allotype.— ♀, same data.

Paratypes.—3 ♂♂, 6 ♀♀, as follows. ARIZONA. 1 ♂, same data as holotype; Phoenix, 2 ♂♂, 4 ♀♀, 12.IV.1949, C.D.C. fly trap 145; Bright Angel (7000 ft.), 2 ♀♀, 10.VII. (H. S. Barber). (Map 37).

***Fannia tescorum*, new species**

Figs. 99, 105, 254

Fannia benjamini, Malloch, 1918, p. 292 (nec Malloch, 1913).

This species is closely related to *benjamini* and *arizonensis*, but can be distinguished from these and others of the group by the tight cluster of strong bristles on the posteroventral surface of the hind femur. Length 3.5-4.5 mm.

Male

Head.—As described for *arizonensis*, but the parafrontals slightly broader (0.04 increasing to 0.10 mm.).

Thorax.—As described for *arizonensis*.

Abdomen.—1.0 by 1.6 mm. Considerably variable in color. The Arizona specimens have the second to fourth segments basally yellow, whereas in the New Mexico specimens only the second segment is yellowish. Linear median vitta distinct, but interrupted at the posterior margin of each segment; lateral spots submarginal, weaker.

Legs.—As in *arizonensis* except for the F_8 pvs. These form a tight cluster of four to six strong but unequal bristles which lack any continuation basad as short setulae.

Hypopygium.—Similar to that of *benjamini* but with the surstylus broad throughout and with a basal ventral swelling.

Female

Closely similar to the other two; and identification further complicated by the variation in abdominal color as noted for the male. Differing from *benjamini* as follows: Third antennal segment and arista yellow basally. Thoracic vittae and scutellar spots weaker, the lateral vittae interrupted. Abdominal color variable as in the male. T_2 median bristles distinctly longer than tibial diameter.

Types

Holotype.— ♂, Alamogordo, New Mexico, 19.IV.1902 (A.N.S.P.).

Allotype.— ♀, same locality, 8.V.1902 (A.N.S.P.).

Paratypes.—7 ♂♂, 8 ♀♀, as follows: 2 ♂♂, same data as type, 1 ♀, Alamogordo, 7.V.1902. ARIZONA. Phoenix, C.D.C. fly trap; 5 ♂♂, 4 ♀♀, 12.IV.1949, 1 ♀, 14.XI.1951, 1 ♀, 9.X.1951; Grand Canyon, 1 ♀, 29.VII.1935 (W. McKean). (Map 36).

setifer subgroup

Fannia setifer, new species

Figs. 102, 107, 107A

This species has no close relatives in the Nearctic region, but there are several Neotropical forms which are very close to it, notably *bahiensis*, *punctipennis*, and *inermipennis*. In general appearance it approaches the *benjamini* subgroup in having a light-colored vittate thorax, yellow abdomen, and posteroventrally tufted hind femora. A distinctive character is the glossy pregenital segment. The above characters will separate it from all other known North American species. Length 4.5-5.5 mm.

Male

Head.—Frontal bristles nine to 12, rather irregular. Parafrontals silvery, broadening (0.04 increasing to 0.15 mm.) toward antennae, separated by a frontal vitta 0.08 mm. wide. Parafacials narrow, without setulae. Postoccipital bristles absent. Third antennal segment dark reddish-brown, rather elongate (0.18 by 0.45 mm.). Palpus dark brown, weakly spatulate.

Thorax.—Ash-grey with three golden-brown vittae, the laterals set far apart. Scutellum brown on basal half. Acr. triserial presuturally, partially quadriserial postsuturally, median bristles weaker. Accessory setulae weak and sparse. Pra. absent or represented by a few setulae. Dorsal row of mesopleurals slightly stronger. Squamae whitish, upper 0.42, lower 0.52 mm. long, and strongly projecting and triangular.

Abdomen.—1.6 by 2.4 mm. Four basal segments largely translucent yellow, weakly whitish-pollinose, brownish-grey pollen distinct on posterior margins

and on entire fifth segment. Median vitta narrowly triangulate, unevenly extended along posterior margin. Yellow integumental color intensified in lateral spots. Two or three strong bristles dorsally on lateral margins of each segment. Composite segment glossy, black, not pollinose.

Legs.—Reddish-brown, tarsi black. F_1 pvs. short but strong to base. T_1 with weak anterodorsal bristle. F_2 avs. with seven or eight weak on basal third, then four stronger medially, and a preapical comb of about 10; pvs. uniserial, evenly short, doubled preapically to form an open clump; ventrally with a full row of setulae. T_2 ventral mat half tibial diameter, even throughout. C_3 with two fine bristle-hairs. F_3 evenly enlarged to two-thirds, then narrowed again to apex; avs. basally one-third femoral diameter, increasing to femoral diameter at the widest point, a space and a weaker preapical; pvs. with fine hairs on basal two-thirds, then a clump of about 12, the longest 1.5 times femoral diameter, apically setulose. T_3 with three or four avs.

Hypopygium.—Cercal plate only weakly divided basally, rather broad. Surstylus rounded and irregular, medially and basally with a deep curving groove. Bacilliform process short, weakly spiralled. Fifth sternum normal, the bristles only weakly concentrated apicad.

Female

Unknown.

Types

Holotype.— ♂, Bexar Co., Texas, 24.I.1931 (H. B. Parks) (C.N.C. No. 6674).

Paratype.— ♂, Laguna, Texas, 1.VII.1917 (R. C. Shannon). (Map 37).

vittata subgroup

Fannia clavata, new species

Figs. 101, 108, 249

This species is easily distinguished from other Nearctic species by the strongly apically swollen hind femora and yellow palpi. The closest relative is *grandis*, described from Panama and to date only recorded from there. It is separated from this species by the shape and bristling of the hind femora. Length 5.0-5.5 mm.

Male

Head.—Frontal bristles 12, fairly regular. Parafrontals silvery, broadening toward antennae (0.04 increasing to 0.15 mm.), separated by a narrow frontal vitta. Parafacials moderately broad, bare. Postoccipital bristles absent. Third antennal segment rather elongate (0.15 by 0.35 mm.), brownish-black except for the inner basal corner. Palpus yellow.

Thorax.—Greyish-brown with five vittae (one along acr. row, one pair between acr. and dsc. rows, and one pair between the dsc. and ia. rows). Scutellum with basal corners brown. Acr. triserial presuturally, quadriserial postsuturally, the median bristles as strong as outer bristles. Accessory setulae sparse but strong. Prealar area with two or three widely spaced bristles in an irregular row, the posterior one strongest. Stigmatal setulae about six. Squamae unequal (0.35 and 0.52 mm.), the lower strongly projecting and triangular in outline.

Abdomen.—Much as in *setifer*, but with moderately distinct dark-pollinose lateral spots at posterior margin on all segments, including the fifth. Composite segment pollinose.

Legs.—Black, tibiae reddish-tinged. F_1 pvs. short but distinct on apical half, with prostrate setulae basad. T_1 without median bristles. F_2 avs. with about eight short on basal half, then 18 to 20 in a strong comb to apex; pvs. with the basal strong, eight strong and even on basal half, then 12 closer-set and stronger, the last three or four very close together and trending sharply onto posterior surface; ventral row weak, present only on median third. T_2 as in *setifer*, but slightly constricted at one-third. C_3 bare. F_3 (see Fig. 249) evenly but strongly enlarged at two-thirds to twice basal diameter, then strongly narrowing to apex; avs. setulose except for two or three strong at two-thirds, and two long weaker preapically; pvs. setulose except for a strong clump of 12 to 15 at two-thirds. T_3 with four or five avs. and three or four ads.

Hypopygium.—Very strikingly modified. Cercal plate short, rather slender, with a pair of short ventral rod-like processes. Surstylus long, the apical half suddenly expanded into a broad, flat, claw-shaped structure. Bacilliform process strongly spiralled. Fifth sternum broader than long, the bristles crowded to the posterior margin.

Female

Unknown.

Types

Holotype.— ♂, Antiguo Morelos (5 mi. W.) (1400 ft.), Tamaulipas, Mexico, 20.VII.1954 (J. G. Chillcott) (C.N.C. No. 6675).

Paratypes.—4 ♂♂, same data.

Fannia micheneri, new species

This species is rather primitive in many characters, with normal hind femora and haired hind coxae, but the thoracic and abdominal coloration places it in the *benjamini* group. Its closest known relative is *vittata* Malloch, described from Panama, from which species it differs by having five distinct thoracic vittae (a strong median and one pair of weak laterals mentioned in original description of *vittata*) and by its larger size (*vittata* only 2.5-3.0 mm. long). Length 4.0 mm.

Male

Head.—Frontal bristles eight, fairly regular, anterior two weak. Parafrontals silvery, narrow (0.04 increasing to 0.10 mm.), separated by a narrow frontal vitta (0.04 mm.). Parafacials narrow, bare. Postoccipital bristles absent. Third antennal segment proportioned as in *setifer*, basally yellow. Palpus clear yellow.

Thorax.—Greyish-brown with five vittae, median one narrow, sublaterals between acr. and dsc. rows and fading out before scutellum, laterals between dscs. and intraalars weaker posteriorly. Scutellum basally brown. Acr. triserial, irregularly quadriserial postsuturally. Accessory setulae weak, moderate in number, triserial outside intraalars, with one slightly stronger in prealar area. Stigmatal setulae about three. Squamae with upper 0.25, lower 0.40 mm. elongate and triangular in shape.

Abdomen.—1.5 by 2.0 mm., marked as described for *clavata*.

Legs.—Black, knees yellowed, tibiae faintly reddish. F_1 pvs. weak on basal third. T_1 without median bristles. F_2 avs. weakly differentiated, with seven or eight on basal half, changing evenly to a comb of about 20; pvs. with basal strong, then evenly and more closely set to apex, ventral row weak, present only near apical third. T_2 with ventral mat reduced to a single row of suberect

setulae. C_s with one bristle. F_s avs. setulose except for two strong and two weak preapically; pvs. with basal half setulose, then six or seven weak bristles extending from one-half to five-sixths, preapical two stronger, apically setulose. T_s with three or four avs., two or three ads.

Hypopygium.—Not studied.

Female

Unknown.

Type

Holotype.—♂, Antiguo Morelos (5 mi. W.) (1400 ft.), Tamaulipas, Mexico, 20.VII.1954 (J. G. Chillcott) (C.N.C. No. 6676).

serena Group

This group of species forms a rather well-defined unit, with no clear affinities to any other group. It may be recognized by the completely linear lower squamae and the preapically bare posteroventral surfaces of the hind femora. The hind coxae are bare and the tibial bristles are usually single. The adults are usually less than 5 mm. long.

There are three subgroups recognizable within the *serena* group. One, the *aerea* subgroup, is characterized mainly by the lobed male cercal plate and well-differentiated mid legs. It is represented on this continent by *aerea* and *serrata*, and in Europe by *aerea, parva*, and *verrallii*.

The two other subgroups are less obviously distinct, and a few species are assigned to one or the other rather arbitrarily. The *serena* subgroup is characterized by strictly biserial acrosticals, scarcely differentiated mid legs with simple bristling, simple surstyli, and apically broadened cercal plate. The *sociella* subgroup is characterized by strictly biserial acrosticals, well-differentiated mid legs with three or four strong thornlike median anteroventrals, tibiae usually with extra bristles, surstyli basally bifurcate, and cercal plate apically rounded. *F. serena, abrupta, immaculata, meridionalis, bradorei*, and *intermedia*, all Nearctic, and *similis, pallitibia, pruinosa, carbonella*, and *nigra* of the Palaearctic region are included in the first subgroup; and *sociella*, the Nearctic *ochrogaster*, and the Palaearctic *spinosa* in the latter. The two intermediate species are the Nearctic *macalpinei*, with the general bristling of the first subgroup and the genitalic structure of the second; and the Palaearctic *ornata* with the bristling of the second subgroup and genitalic structure of the first.

Male

Head.—Frontal bristles six to 12. Parafrontals silvery- to brown-pollinose, contiguous (except in northern specimens), narrow. Parafacials without setulae. Occipital bristles variable from long and irregular to short and even. Post-occipital bristles present or absent. Second antennal segment with a single strong bristle, third segment twice as long as broad. Arista subpubescent. Palpus normally long and linear; theca short pollinose, weakly sclerotized.

Thorax.—Black, grey- to brown-pollinose, not vittate. Acr. bristles variable from biserial to fully triserial. Accessory setulae variable. Prealars one strong, or two subequal. Stigmatal setulae variable from none to several. Mesopleural setulae moderate in number, usually distinctly stronger dorsad. Scutellum normal. Squamae fully variable in color; the lower linear, not even basally lobate. Haltere and wing similarly variable in color.

Abdomen.—From one-half to two-thirds as broad as long. Pollen variable from dark brown, obscuring the median vitta, to bluish-grey, with distinct, triangulated vitta.

Legs.—Entirely black to yellow with black tarsi. F_1 with full row of strong pvs. T_1 without distinct median bristles (one preapical dorsal in *sociella*). F_2 bristles variable in extent of differentiation (very strongly differentiated in the *sociella* subgroup). T_2 variable in development, apically from 1.5 to 2.0 times basal diameter, ventral mat basally weak, apically thicker and stronger; medially with one ad., one pd. (two or three ads. in *sociella*, no pd. in *aerea*). Mt_2 uncrested except in *aerea*. C_3 bare. F_3 normal, avs. basally setulose, apically with three or four preapicals, strong (none in *aerea*); pvs. setulose on basal half to three-fourths, apically bare (except in *sociella* subgroup). T_3 usually with one av., one ad. (no av. in *sociella*, six to eight avs. in *ochrogaster*, one to three ads. in the *sociella* subgroup); pvs. absent except in *ochrogaster*.

Hypopygium.—Cercal plate strongly fused basad, apically r o u n d e d, broadened, or bilobed, at most weakly elongate. Surstylus medially or laterally elongate, simple and curved medially in the *serena* subgroup, strongly bifurcate from the base in most species of the *sociella* and *aerea* subgroups, simple and curved dorsally in *aerea*. Bacilliform process variable from strongly spiralled to strongly hooked or curved, rarely absent. Ninth sternum simple, straplike laterally and rather reduced; aedeagus membranous. Fifth sternum variable, longer than broad with scattered bristles in the *serena* subgroup, broad and distinctly lobed apically in the *sociella* subgroup, reduced both in size and bristling in the *aerea* subgroup.

Female

Much less variable than the males, with the subgroups not distinct.

Head.—Parafrontals variable from one-third to one-fourth as wide as long, pollinosity variable from glossy to fully grey-pollinose; setulae uniserial. Antenna and proboscis as in the male.

Thorax.—As in the male, but squamae, haltere, and wing always whitish.

Abdomen.—Variable from sparsely pollinose and subshining to almost fully glossy.

Legs.—F_1 pvs. usually strong only on apical half, basally setulose. T_1 normal. F_2 avs. and pvs. evenly setulose. T_2 with one or two ads., one pd. F_3 avs. with two to four strong preapically, setulose basally; pvs. apically absent. T_3 with one or two avs., one to three ads.

Ovipositor.—Subanal plate variable from broader than long to distinctly longer than broad, discally evenly setulose. Cercus short or normal. Eighth tergum normal, sternum with normal pair of setulose plates with at most a faint basal thickening. Seventh segment normal, sternum slightly broader than long. Sixth segment normal, tergum containing both posterior spiracles, usually situated close to the margins. Spermathecae two, barrel-shaped or basally broadened, sometimes much elongate, surface smooth to fully corrugated, apically indented. Duct base usually long, basally curved and swollen.

Larva

Only known for the atypical *macalpinei*. See description of that species.

serena subgroup

Fannia serena (Fallén)

Figs. 109, 109A, 114, 196

Musca serena Fallén, 1825, p. 75.
Anthomyia serena, Meigen, 1826, p. 200.
Anthomyza serena, Zetterstedt, 1838, p. 685.
Aricia serena, Zetterstedt, 1845, p. 1594; Zetterstedt, 1849, p. 3299.
Homalomyia serena, Osten Sacken, 1878, p. 170; Hagen, 1881, p. 48; Meade, 1882, p. 204; Strobl, 1893, p. 240; Stein, 1895, p. 100; Meade, 1897, p. 65; Pandellé, 1899, p. 193; Aldrich, 1905, p. 539; Wingate, 1906, p. 282.
Fannia serena, Stein, 1907a, p. 664; Schnabl and Dziedzicki, 1911, p. 137, Figs. 369, 370, 840; Malloch, 1912a, p. 234; Stein, 1913, p. 25; Stein, 1915b, p. 136; Frey, 1916, p. 691; Kramer, 1917, p. 41; Riedel, 1918, p. 166; Stein, 1920, p. 45; Séguy, 1923, p. 273; Ringdahl, 1928, p. 64; Karl, 1928, p. 64; Riedel, 1930, p. 79; Audcent, 1932, p. 365; Tiensuu, 1935, p. 157; Grensted, 1944, p. 203; Ringdahl, 1944a, p. 17; Grensted, 1946, p. 15; Zangheri, 1950, p. 88; Kabos, 1951, p. 127; Ringdahl, 1951, p. 167; Ringdahl, 1952, p. 158; Ringdahl, 1954a, p. 79; Hennig, 1955, p. 83, Figs. 57, 90; Collin, 1958, p. 92.
Anthomyia luctuosa Meigen, 1826, p. 156; syn. (p.p.) *teste* Stein, 1895.
Aminta floralis Robineau-Desvoidy, 1830, p. 571; syn. *teste* Stein, 1907a.
Fannia subsimilis Ringdahl, 1934a, p. 120, Fig. 17; Ringdahl, 1954a, p. 78; syn. *teste* Hennig, 1955.

This species is fairly closely related to the Palaearctic *carbonella* and rather closely to the Nearctic species *intermedia, immaculata,* and *meridionalis.* It is separated from the first by the setulose hind-femoral pvs., and from the others by the following combination of characters: postoccipital bristles present (in all but some southern Nearctic specimens), squamae and haltere infuscated, and the brownish-pollinose abdomen with the median vitta partially obscured. Length 4.5-5.0 mm.

Male

Head.—Frontal bristles six to eight, even, long, with a few interstitials anteriorly. Parafrontals narrow (0.04 to 0.06 mm.), silvery. Occipital bristles long, slender, quite irregular dorsad. Postoccipital bristles irregular, normally extending almost to vertical bristles.

Thorax.—Acr. strictly biserial, long. Accessory setulae scanty. Pra. two, the posterior one slightly smaller. Stigmatal setulae one or none. Squamae and haltere yellow-brown. Wing veins dark brown, membrane darkened basad.

Abdomen.—1.3 by 2.5 mm. Thickly dark-brown- to bluish-brown-pollinose, median stripe triangulated, distinct, somewhat obscured on posterior segments.

Legs.—Black, at most the foreknees yellowish. F_2 only slightly constricted basad; avs. with five to seven widespaced, long (half femoral width) on basal half, changing gradually to a preapical comb of 12 to 15; pvs. longer, evenly decreasing on basal four-fifths, with four or five rather short preapicals; ventral row on median third. T_2 weakly enlarged apically, hair mat short basally, increasing on apical half until as long as tibial diameter. F_3 avs. with three strong preapicals, erect setulae to base; pvs. with erect setulae on basal third to half.

Hypopygium.—Cercal plate strongly broadened apically and truncate or faintly scalloped at the apex. Surstylus simple, curved medially. Bacilliform process distinct, spiralled.

Female

Head.—Parafrontals sparsely but evenly pollinose, subshining, one-third as broad as long. Occipital bristles moderate, even. Postoccipital bristles few, scattered or absent dorsally. Parafacials narrower than in the male.

Abdomen.—Subshining black.

Legs.—T_2 with one ad., one pd. T_3 with one av., one ad.

Remarks

There is no information on the biology of this species. It is known in Europe from northern Scandinavia and Scotland south to the Mediterranean, and as far east as the southern Urals. In North America it extends from the Aleutians and northern Alaska south to California, but does not occur east of the Rockies.

Type locality and type

Skäne, Sweden. Type location not known.

Records, 73 ♂♂, 46 ♀♀ (Map 38)

ALASKA. Matanuska, 1 ♂, 1 ♀ (from soil cage); Sitka, 2 ♂♂; Skagway, 1 ♂; Anchorage, 4 ♂♂, 1 ♀; Juneau, 2 ♀♀; Camp 334, Alsk. Eng. Comm., 1 ♀; King Salmon, Naknek R., 9 ♂♂, 9 ♀♀; on tundra, Naknek, 4 ♂♂, 4 ♀♀; on tundra, Cold Bay (163°W.), 1 ♀. BRITISH COLUMBIA. Mission City, 20 ♂♂; Clayburn, 11 ♂♂; Big Qualicum R., Qualicum, 1 ♂; Robson, 2 ♂♂; Cultus Lake, 1 ♂, 1 ♀; Miner, 3 ♂♂, 1 ♀; Pitt Meadows (Peat Bog), 4 ♂♂; Miracle Beach, nr. Oyster R., 1 ♀; Downie Creek, Selkirk Mts., 1 ♀; Bowser, 1 ♀. ALBERTA. Elkwater Park, 3 ♂♂. WASHINGTON. Seaview, 3 ♂♂; Seattle, 1 ♂; Ilwaco, 1 ♂, 2 ♀♀; Canyon Creek, 1 ♀; Glacier, 2 ♀♀; Lake Cushman, 1 ♀; Copalis, 3 ♀♀; Tacoma, 1 ♀. MONTANA. Missoula, 1 ♀. IDAHO. Priest Lake, 1 ♀. OREGON. Independence, 1 ♀. UTAH. Eden, 1 ♀. COLORADO. Rabbit Ears Pass, 1 ♀. CALIFORNIA. Smith River, 5 ♀♀; Sequoia Nat. Park, 1 ♀.

Collecting dates from May 31 to August 23.

I have examined also 35 ♂♂, 30 ♀♀ from England, Sweden, Germany, and Austria.

Fannia intermedia, new species

Figs. 110, 110A, 115, 115A

This species is almost identical in chaetotaxy with *serena*, but the striking difference in abdominal coloration — blue-grey with linear median vitta — sets it clearly off from that species. The coloration in fact is almost identical with that of *meridionalis*, which differs in having no postoccipital bristles, and frequently only one prealar (on at least one side). Length 4.5-5.5 mm.

Male

Head.—Frontal bristles six to eight, even, long, with a few interstitials. Parafrontals silvery, narrow (0.04 increasing to 0.06 mm.), weakly contiguous. Occipital bristles long, slender, quite irregular. Postoccipital bristles variable, usually extending at least half-way to verticals.

Thorax.—Acr. strictly biserial, long. Accessory setulae scanty. Pra. two, the posterior one slightly smaller. Stigmatal setulae one or none. Squamae and haltere clear yellow. Wing veins medium brown, membrane not darkened basad.

Abdomen.—1.1 by 2.0 mm. Bluish-grey-pollinose, the median vitta linear, more or less distinct.

Legs.—As described for *serena*, except F_3 avs. with only two strong preapicals.

Hypopygium.—As described for *serena* but cercal plate strongly concave on apical margin.

Female

Virtually indistinguishable from *serena*.

Types

Holotype.– ♂, Anchorage, Alaska, 11.VI.1921 (J. M. Aldrich) (U.S.N.M. No. 64282).

Allotype.– ♀, same data as holotype (U.S.N.M.).

Paratypes.–6 ♂♂, 8 ♀♀, as follows: ALASKA. 2 ♂♂, same data as holotype; 1 ♂, 13.VI.1921; 3 ♀♀, 10.VI.1921; 2 ♀♀, 20.VI.1921 (same locality and collector); 1 ♂, Fairbanks, 25.VI.1952 (J. B. Hartley); 1 ♀, Fairbanks, 30.VI.1921 (J. M. Aldrich); 1 ♀, 16.VI.1952 (same locality and collector); 1 ♂, 1 ♀, Curry, 29.VI.1952 (W. R. M. Mason). ALBERTA. 1 ♂, McMurray, 11.VI.1953 (G. E. Ball).

Additional Records (Map 39)

ALASKA. 1 ♀, Anchorage, 31.VII.1951 (R. S. Bigelow). BRITISH COLUMBIA. 1 ♀, Alaska Hwy. Mile 229, 25.VI.1952 (C. P. Alexander).

I debated the validity of this species for some time, but the lack of any intermediates between it and *serena*, the fairly distinct male and female genitalia, and the long gap between it and the southern species *meridionalis* have led me to treat it as distinct.

Fannia immaculata Malloch

Figs. 112, 117, 197

Fannia nigra Stein, 1920, p. 43 (nec Malloch).
Fannia immaculata Malloch, 1924a, p. 424, *nomen novum* for *nigra* Stein (preocc).
Fannia canadensis Malloch, 1924a, p. 423 (new synonymy).

This species has been frequently misidentified in this country as *serena* Fall. It is closely related, but differs in the complete lack of postoccipital bristles, even short occipital bristles, and the heavily brown-pollinose abdomen, the fifth segment not subshining. The above characters also separate it from all other related species. There is considerable variation in squamal and parafrontal color.

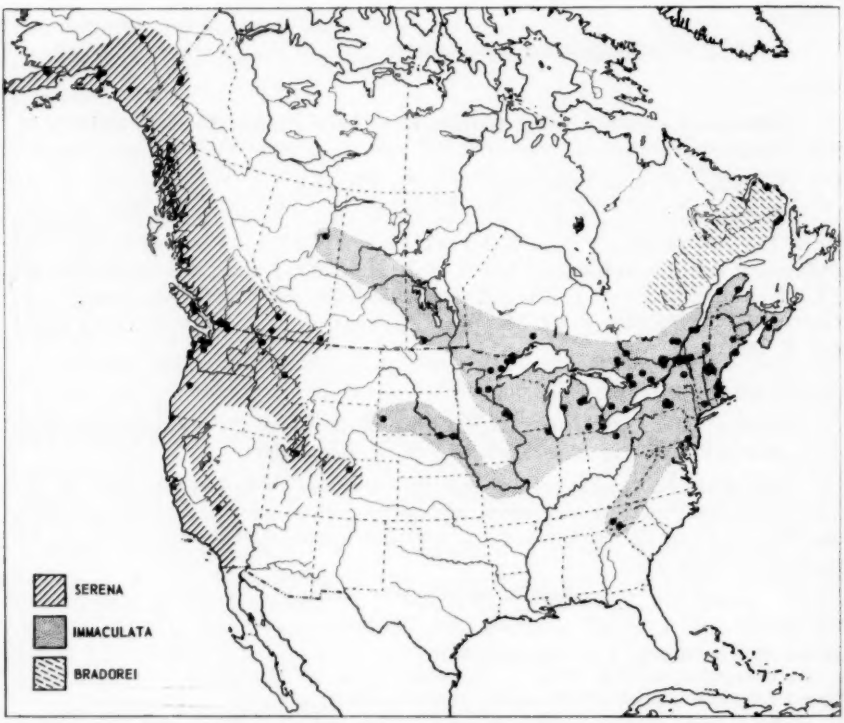
About 10 per cent of the males in the broad contact zone between this species and *meridionalis* appear to be somewhat intermediate, indicating possible hybridization. However the percentage is small enough that I have little hesitation in considering them distinct species. Length 4.0-4.5 mm.

Male

Head.–Frontal bristles variable from four to eight, strong, with a few interstitials, extending almost to ocellar triangle (in type of *canadensis* with eight, present only on anterior two-thirds). Parafrontals very narrow, variable in color from a dull silvery to a medium brown (upper half brown in type of *canadensis*). Occipital bristles short, regular. Postoccipital bristles absent.

Thorax.–Acr. strictly biserial, long. Accessory setulae short, sparse. Pra. one or two (most commonly with one on one side, two on the other). Stigmatal setulae one or none. Squamae and haltere pale yellowish-brown to dark brown (pale brown in type of *canadensis*). Wing veins medium to dark brown.

Abdomen.–Rather variable in width from 1.1 to 1.6 mm., 2.0 mm. long. Greyish-brown- to dark-brown-pollinose, the fifth segment bluish-tinged. Median vitta obscured, but still discernible throughout.



Map 38. Geographic distributions of *F. serena* (Fall.), *F. immaculata* Mall., and *F. bradorei* Chill.

Legs.—As described for *serena.* The type of *canadensis* has no T_8 av. bristle, but this is almost certainly an individual aberration, since in all other respects it matches perfectly with numerous specimens from the same general area.

Hypopygium.—As described for *serena.*

Female

Head.—Parafrontals completely glossy on upper two-thirds, one-third as broad as long. Occipital bristles short, even. Postoccipital bristles absent.

Thorax.—Pra. usually one, strong (rarely two). Squamae very slightly yellowish. Wing veins clear yellow.

Abdomen.—Black, the dorsum lightly pollinose, the lateral margins glossy, increasingly so caudad, the entire fifth segment glossy except for a median basal spot.

Legs.—Black, the foreknees yellowish. Bristled as described for *serena.*

Type locality and type

Montreal, Quebec. Type in Deutsche Entomologische Institut, Berlin.

Type locality of *canadensis*: Gold Rock, Ontario. Type in Illinois Natural History Survey Collection.

Records, 87 ♂♂, 90 ♀♀ (Map 38)

NOVA SCOTIA. Kentville, 3 ♀♀; Truro, 1 ♀. QUEBEC. Joliette, 1 ♂; Harrington Lake, Gatineau Park, 1 ♂; Gatineau Park, 1 ♂; Beaulieu, 2 ♀♀; Berthierville, 1 ♂; Montreal, 1 ♂; Ile de Montreal, 1 ♀; Megantic, 3 ♂♂; Aylmer, 2 ♂♂; Abbotsford, 2 ♂♂, 2 ♀♀; Roberval, 1 ♂; Beechgrove, 2 ♂♂; Wakefield, 1 ♂, 1 ♀; St. Johns, 1 ♂; Chambly Co., 1 ♂; Hull, 1 ♂; Woburn, 1 ♂; Fairy Lake, 1 ♂; Cascapedia, 1 ♀; Cap Chat, 1 ♀; Laniel, 1 ♀. ONTARIO. Ottawa, 8 ♂♂, 11 ♀♀; Maynooth, 2 ♂♂, 2 ♀♀; Marmora, 1 ♀; Low Bush, Lake Abitibi, 2 ♂♂, 4 ♀♀; Norway Point, Lake of Bays, 1 ♂; Macdiarmid, Lake Nipigon, 1 ♀; Sault Ste. Marie, 1 ♀; Grand Bend, 3 ♂♂, 8 ♀♀; Simcoe, 6 ♀♀; Strathroy, 1 ♀; Point Pelee, 1 ♀; Fenelon Falls, 1 ♂. MICHIGAN. Washington Co., 1 ♂, 1 ♀; Bay Co., 3 ♂♂, 1 ♀; Midland Co., 2 ♂♂, 1 ♀; Muskegon, 1 ♀. MINNESOTA. Grand Rapids, 3 ♂♂, 1 ♀; Cascade River, Cook Co., 1 ♂, 1 ♀; St. Louis Co., 1 ♂; Itasca Park, 1 ♀; Garrison, Mille Lacs Lake, 1 ♂, 1 ♀; Burnside, 1 ♂; Jutsen, 1 ♀; Lake Pepin, E. Frontenac, 1 ♀; Basswood Lake, Lake Co., 7 ♀♀; near Lakeland, 1 ♀. SOUTH DAKOTA. Custer, 1 ♂, 1 ♀; Yankton, 1 ♂; Spearfish, 1 ♂; Canton, 1 ♀. ILLINOIS. Algonquin, 1 ♂. INDIANA. Lafayette, 2 ♂♂. OHIO. Summit Co., 1 ♂. NEW HAMPSHIRE. Bretton Woods, 1 ♂; Mt. Adams (5790 ft.), 1 ♂; Mt. Madison (4925 ft.), 1 ♂; Franconia, 2 ♂♂; White Mts., 3 ♂♂; Glen House, 1 ♂; Hampton, 1 ♀; Intervale, 1 ♀; North Haverkill, 1 ♀; Noxen Camp (2000 ft.), 1 ♂. MASSACHUSETTS. Auburndale, 1 ♂; North Bedford, 1 ♂. MAINE. Bar Harbor, 1 ♂; Princeton, 1 ♀; Fort Kent, 1 ♀. CONNECTICUT. Canaan, 8 ♀♀. NEW YORK. Danby, 1 ♂; Ellis, Slaterville, 1 ♂; Ithaca, 5 ♂♂, 4 ♀♀; Whiteface Mt., Adirondacks, 1 ♂, 2 ♀♀; McLean, 2 ♂♂; Coy Glen, 3 ♂♂. PENNSYLVANIA. Delaware Co., 1 ♀; Hazelton, 3 ♂♂.

Collecting dates from May 27 to August 31.

Fannia meridionalis, new species

This species, like the preceding, has been rather frequently misidentified as *serena* Fall. It is easily recognized from this and other related species by the strikingly greyish- to greenish-blue-pollinose abdomen, the pale legs and squamae, the long, alternating occipital bristles, and the lack of postoccipital bristles.

The species has a generally more southern distribution than *immaculata*, but there is a broad zone of overlap in which a small percentage of specimens appear to be hybrids with *immaculata*. See the note under the latter species, and also the comparative notes under *intermedia*.

Male

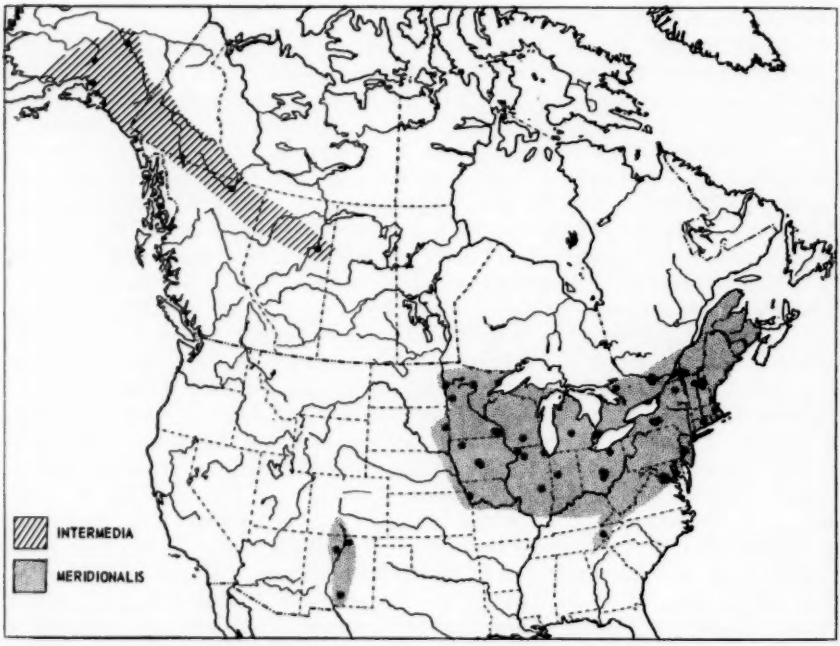
Head.—Frontal bristles and parafrontals as described for *immaculata*, but the parafrontals never brown-pollinose. Occipital bristles short and regular laterally, but long and irregular on upper portion. Postoccipital bristles absent.

Thorax.—As described for *immaculata*, but thoracic sutures usually pale. Squamae clear, haltere yellow, wing veins yellow.

Abdomen.—1.2 by 2.0 mm., distinctly blue-pollinose, rarely with greenish or greyish tints. Median vitta linear or largely obscured, never visibly triangulated.

Legs.—As described for *serena*, but all knees and trochanters pale, tibiae sometimes reddish.

Hypopygium.—As described for *serena*.



Map 39. Geographic distributions of *F. intermedia* Chill. and *F. meridionalis* Chill.

Female

Almost inseparable from *immaculata*, but the more yellow tibial bases and thoracic sutures, and the somewhat more pollinose abdomen (fifth segment largely pollinose) will separate the majority of specimens.

Types

Holotype.– ♂, Lafayette, Indiana, 16.V.1917 (J. M. Aldrich) (U.S.N.M. No. 64283).

Allotype.– ♀, same data.

Paratypes.–13 ♂♂, 19 ♀♀, as follows: 7 ♂♂, 1 ♀, same data; 2 ♂♂, 2 ♀♀, 16.V.1916; 2 ♂♂, 1 ♀, 25.V.1916; 1 ♂, 24.V.1915; 1 ♂, 4.IV.1918; 5 ♀♀, 18.V.1916; 1 ♀, 14.V.1918; 1 ♀, 11.V.1916; 1 ♀, 25.IX.1915; 1 ♀, 12.V.1915; 3 ♀♀, 27.V.; 3 ♀♀, 28.V.; 1 ♀, 23.V. (all same locality and collector).

Additional Records, 64 ♂♂, 150 ♀♀ (Map 39)

New Hampshire. Mt. Washington, 1 ♂; Franconia, 2 ♂♂; Franconia Notch, 1 ♂; White Mts., 3 ♂♂, 1 ♀; North Haverhill, 3 ♀♀; Benton, 1 ♀. Massachusetts. Sussex, 1 ♀; North Bedford, 1 ♀. Vermont. Lynden, 3 ♀♀. Connecticut. Canaan, 1 ♂, 19 ♀♀. Quebec. Abbotsford, 1 ♂; Beechgrove, 1 ♂; Old Chelsea, 1 ♂; Wakefield, 1 ♀; Meach Lake, 2 ♀♀; Ile de Montreal, 1 ♀; St. Johns, 1 ♀. Ontario. Ottawa, 1 ♂, 6 ♀♀; Charlton, 1 ♂; Haileybury, 1 ♀; Coniston, 1 ♀. New York. Ithaca, 4 ♂♂, 16 ♀♀; Coy Glen, 2 ♀♀; McLean Bog, 3 ♀♀; Ashford, 2 ♀♀; Geneva, 1 ♀; Whiteface Mts., Adirondacks, 3 ♀♀. Pennsylvania. Roxborough, 15 ♀♀; Castle Rock,

1 ♀; Delaware Co., 4 ♂♂, 2 ♀♀; Germantown, 1 ♀. NEW JERSEY. Trenton, 2 ♂♂, 1 ♀; Pemberton, 1 ♂. MARYLAND. Plummers Island, 4 ♂♂, 6 ♀♀; nr. Plummers Island, 5 ♀♀; Cabin John, 1 ♂; Baltimore, 1 ♀. DISTRICT OF COLUMBIA. Washington, 1 ♂; Chain Bridge, 2 ♀♀. VIRGINIA. Maywood, Alexandria Co., 1 ♀; Great Falls, 1 ♂, 1 ♀; Chain Bridge, 1 ♂; Arlington, 1 ♂, 1 ♀; Dead Run to Turkey R., 1 ♂; Dead Run, Fairfax Co., 2 ♀♀. TENNESSEE. University Farm, Knox Co., 1 ♀. OHIO. Summit Co., 1 ♀; Lockburn, 1 ♀; Franklin Co., 1 ♂; Columbus, 1 ♂. MICHIGAN. East Lansing, 1 ♀. INDIANA. Lafayette, 1 ♀. ILLINOIS. Algonquin, 3 ♂♂, 4 ♀♀; Oregon, 1 ♀; White Heath, 1 ♀; Elizabeth, 1 ♀. IOWA. Ames, 3 ♂♂, 1 ♀; Ledges State Park, 3 ♂♂; W. Okoboji, 1 ♂. MISSOURI. Shrewsbury, 1 ♂, 4 ♀♀; Atherton, 1 ♂. MINNESOTA. Grand Marais, 5 ♂♂; Houston Co., 3 ♂♂, 3 ♀♀; Norman Co., 1 ♂; Grand Rapids, 1 ♀; Winnebago Ck., Houston Co., 2 ♀♀; Olmstead Co., 2 ♀♀. WISCONSIN. Madison, 1 ♂, 3 ♀♀; Dane Co., 6 ♀♀. SOUTH DAKOTA. Brookings, 1 ♀. NORTH DAKOTA. Grand Forks, 1 ♂. MANITOBA. Dauphin, 1 ♂, 2 ♀♀; Teulon, 1 ♀. COLORADO. Cuchara, 4 ♀♀. NEW MEXICO. Jemez Springs, 1 ♂; Cloudcroft, 1 ♂; Rio Grande, Taos Co., 1 ♀.

Collecting dates from April 27 to September 25.

Male intermediates *immaculata* — *meridionalis*

Records, 12 ♂♂

QUEBEC. Abbotsford, Hull, Fairy Lake. ONTARIO. Kearney, Ottawa, Jordan, Burke Falls, Pt. Ryerse. NEW HAMPSHIRE. White Mts., Franconia. NEW YORK. Ithaca (2).

***Fannia bradorei*, new species**

Figs. 111, 116

This species is only known from a small area in eastern Quebec, and may later prove to be only a subspecies of *immaculata* or *intermedia*, but on present information it seems best to consider it a valid species. The complete lack of postoccipital bristles, the distinct frontal vitta, and the long irregular occipital bristles, combined with the pollinosity and color of the dark forms of *serena* (abdomen bluish-brown-pollinose with indistinct vitta, squamae and haltere yellow-brown) set it off distinctly from the other Nearctic species. Length 4.0-4.5 mm.

Male

Head.—Frontal bristles about eight, irregular. Parafrontals silvery or tinged with brownish pollen dorsad, fairly broad (0.03 increasing to 0.08 mm.), separated by a distinct frontal vitta (0.01-0.08 mm.). Occipital bristles long and irregular. Postoccipital bristles absent.

Thorax.—As in *serena* and *immaculata*, except usually with one strong pra., and sometimes another setulose bristle dorsally or posteriorly.

Abdomen.—1.2 by 2.0 mm. Brown- to bluish-brown-pollinose, the median vitta frequently obscured on posterior segments.

Legs.—As described for *serena*.

Hypopygium.—As described for *intermedia*.

Female

Only known with certainty from two damaged specimens. Apparently identical with females of *immaculata*.

Types

Holotype.– ♂, Bradore Bay, Quebec, 27.VII.1929 (W. J. Brown) (C.N.C. No. 6679).

Paratypes.–15 ♂ ♂, 2 ♀ ♀, as follows: 11 ♂ ♂, 1 ♀ (damaged), 19.VII.1929; 1 ♂, 16.VII.1930; 1 ♂, 9.VII.1930; 1 ♂, 1 ♀, 27.VII.1929 (all same locality and collector as type); 1 ♂, Thunder River, Quebec, 13.VI.1930 (W. J. Brown); 1 ♂, Mistassini Post, Quebec, 20.VII.1956 (J. R. McGillis). (Map 38).

Fannia abrupta Malloch

Figs. 113, 118, 198

Fannia abrupta Malloch, 1924a, p. 423.

This species has been misidentified as *carbonella* Stein in this country, but, although the external appearance is very similar, the hind-femoral posteroventrals are distinctly longer and the genitalia are distinctly different. It is separable from all Nearctic relatives by the many postoccipital bristles and stigmatal setulae, and the long, bristle-like, hind-femoral posteroventrals. Length 3.5-4.5 mm.

Male

Head.–Frontal bristles nine to 11, long, with a few interstitials. Parafrontals almost contiguous, narrow, silvery, brownish-pollinose toward ocellar triangle. Occipital bristles long, slender, quite irregular. Postoccipital bristles present in a full row to verticals. Third antennal segment 1.5 times as long as broad.

Thorax.–Acr. strictly biserial. Accessory setulae long and numerous. Pra. two, the posterior one smaller. Stigmatal setulae six to eight. Squamae and haltere yellow-brown to dark brown. Wing veins dark brown.

Abdomen.–1.3 by 2.2 mm. Dark bluish-brown-pollinose, median vitta obscured on last two segments, fifth segment distinctly bluish-pollinose.

Legs.–Black, at most the foreknees yellowish. As described for *serena*, except that there is occasionally an extra T_2 ad., or pd.; and the F_3 pvs. are bristle-like, increasing from femoral width basally to 1.5 times femoral width at four-fifths, apically bare.

Hypopygium.–Cercal plate with the outer edges parallel-sided, the apical processes only weakly divergent. Surstylus rather broad basally, constricted on apical third. Bacilliform process broad, flattened, distinctly spiralled.

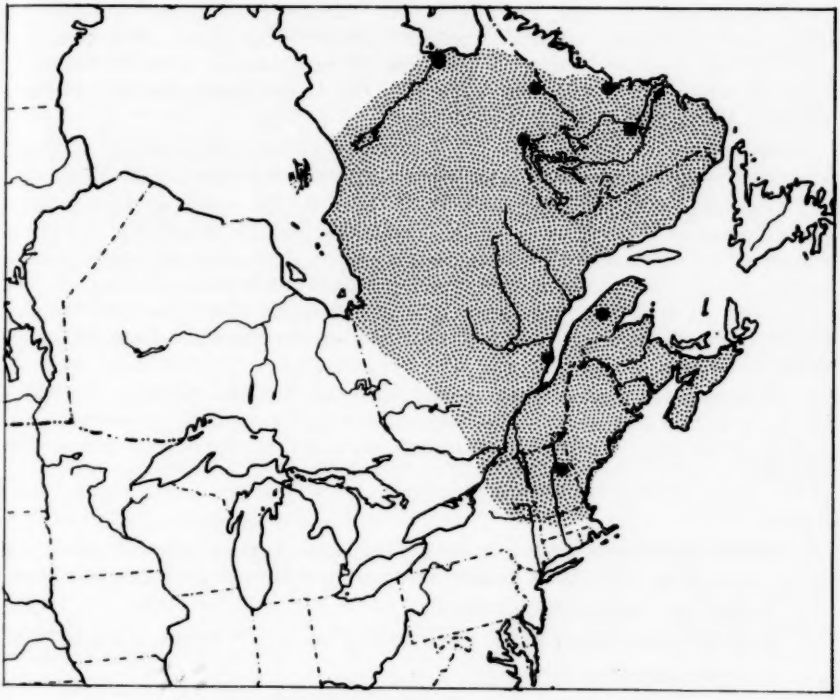
Female

Head.–Parafrontals subshining, slightly more evenly pollinose than in *serena*, one-third as broad as long. Parafrontal setulae in one irregular row. Occipital bristles slightly uneven dorsad. Postoccipital bristles irregular, sparse to verticals.

Thorax.–Mesopleurals with a distinctly stronger row. Stigmatal setulae two to four. Squamae light yellow, the margin distinctly darker. Wing veins yellow-brown.

Abdomen.–Evenly but faintly pollinose, subshining black.

Legs.–F_1 pvs. decreasing basad, but remaining bristle-like throughout. F_2 avs. stronger, with three or four on basal half distinctly bristle-like, erect setulae to apex; pvs. as strong erect setulae on basal two-thirds. F_3 pvs. setulose, present on basal two-thirds.



Map 40. Geographic distribution of *F. abrupta* Mall.

Type locality and type

Mt. Washington, New Hampshire. Type in Museum of Comparative Zoology, Cambridge, Massachusetts.

Records, 46 ♂♂, 9 ♀♀ (Map 40)

QUEBEC. Knob Lake (54°47′, 66°47′), 41 ♂♂, 5 ♀♀; Indian House Lake, 1 ♂; Fort Chimo, 1 ♀; Mt. Albert, 1 ♂; Natashquan, 1 ♀. LABRADOR. Goose Bay, 2 ♀♀; Menihek, 1 ♂. NEW HAMPSHIRE. Mt. Washington, 2 ♂♂.

I have seen specimens of *carbonella* from Are, Sweden, 1 ♂, 1 ♀.

Fannia macalpinei, new species

Figs. 119, 122, 199, 279

This species appears to be intermediate between the *serena* and *sociella* subgroups, with the bristling of the former but the genitalic structure of the latter. It may be recognized from the species of the *serena* subgroup by the partially triserial acrosticals, and from the *sociella* subgroup by the undifferentiated mid-femoral bristles. Length 3.0-4.0 mm.

Male

Head.—Frontal bristles five or six, weak, extending only halfway to ocellar triangle. Parafrontals silvery, contiguous, increasing slightly apicad. Occipital bristles short and regular. Postoccipital bristles absent.

Thorax.—Acr. triserial, the median row variable from almost complete to only a few postsutural setulae. Accessory setulae quite sparse. Pra. two, the posterior one variable in size. Dorsal row of mesopleurals distinctly stronger. Squamae white, margins faintly yellowish, the lower faintly lobate. Haltere yellow. Wing veins medium brown.

Abdomen.—1.0 by 1.7 mm., bluish-grey-pollinose, median vitta scarcely broadened on posterior margins, almost linear, vitta not evident on fifth segment.

Legs.—Black, at most foreknees yellowish. F_2 avs. seven or eight, wide-spaced, equal to femoral width on basal half, then rapidly shortening to form a preapical comb; pvs. scarcely longer, fine, gradually shortening and strengthening to two strong at four-fifths, a break, and a preapical comb of four or five. F_3 avs. with three or four strong preapicals, erect setulae to base; pvs. erect setulae basally, increasing to 1.5 times femoral width on median third, bare on apical third.

Hypopygium.—Cercal plate weakly elongate, swollen apically. Surstylus bifurcate with a slender incurving ventral arm and a medially broadened projecting dorsal arm. Bacilliform process short, broad, faintly curved downwards apically.

Female

Head.—Parafrontals only faintly shining, evenly grey-pollinose, one-third as broad as long. Occipital bristles short, even. Postoccipital bristles absent.

Thorax.—As described for the male.

Abdomen.—Subshining bluish-black, evenly but lightly pollinose throughout.

Legs.—As described for *serena.*

Remarks

This species has been reared from a moist, decaying poplar stump.

Larva (Fig. 279)

Integument sparsely tuberculate with numerous broader integumental platelets (Fig. 279, C). Laterodorsal processes long and well developed, with weak, simple lateral projections on basal third, the lateral projections continuing strong along segmental margins to base of segment; processes of caudal segment with posterior and sublateral pairs short and subequal, lateral pair almost twice as long; lateroventral and dorsal processes absent or very small. Cephalic and lateral processes of first thoracic segment short. Anterior spiracle small and inconspicuous, without apparent processes. Posterior spiracular stalk situated on margin of caudal segment just basad of lateral process, moderately short, the spiracular processes short but distinct, curled and irregular in shape. Mouth hooks strongly atrophied, represented by slender, weakly sclerotized rods.

Description based on several larvae and puparia from a rotted poplar stump at Carp, Ontario.

Types

Holotype.—♂, Carp, Ontario, 30.IV.1954 (J. F. McAlpine) (reared from larvae in rotted poplar stump).

Allotype.—♀, same data as type.

Paratypes.—4 ♂♂, 6 ♀♀, same data as type; 1 ♂, Lac Mondor, nr. Ste. Flore, Quebec, 27.V.1951 (E. G. Munroe).

sociella subgroup
Fannia sociella (Zetterstedt)

Figs. 120, 123, 201

Aricia sociella Zetterstedt, 1845, p. 1564.
Homalomyia sociella, Schiner, 1862, p. 655; Strobl, 1893, p. 240; Stein, 1895, p. 89; Meade, 1897, p. 64; Pandellé, 1899, p. 194; Wingate, 1906, p. 281.
Fannia sociella, Stein, 1907a, p. 664; Malloch, 1912a, p. 204; Ringdahl, 1912, p. 214; Malloch, 1913a, p. 627; Stein, 1913, p. 25; Stein, 1916, p. 81; Kramer, 1917, p. 40; Riedel, 1918, p. 166; Séguy, 1923, p. 274, Fig. 524; Ringdahl, 1926, p. 8; Karl, 1928, p. 60; Riedel, 1930, p. 79; Audcent, 1932, p. 365; Ringdahl, 1934a, p. 120; Tiensuu, 1935, p. 44; Tiensuu, 1936, p. 165; Karl, 1937, p. 129; Aczél, 1940, p. 34; Ringdahl, 1944a, p. 17; Frey, 1949, p. 105; Ringdahl, 1951, p. 167; Ringdahl, 1952, p. 158, Fig. 19; Ringdahl, 1954a, p. 78; Hennig, 1955, p. 85, Figs. 50, 81, Text Fig. 29; Collin, 1958, p. 91.
Fannia parallela Johannsen, 1916, p. 390 (new synonymy).

This species is easily recognized from all related forms by the three strong, median, anteroventral mid-femoral bristles, and the dark, blue-grey-pollinose abdomen. Length 5.0-5.5 mm.

Male

Head.—Frontal bristles six to nine, long, with long interstitials anteriorly. Parafrontals narrow, silvery-white. Occipital bristles even, short, at most four longer dorsad. Postoccipital bristles absent.

Thorax.—Acr. biserial, strong. Accessory setulae sparse and short. Pra. two, the posterior one slightly smaller. Mesopleurals with dorsal row only slightly stronger, but with one or two strong anterodorsally. Stigmatal setulae one or two. Squamae whitish, the lower broadly linear. Haltere yellow. Wing veins medium brown.

Abdomen.—1.4 by 2.2 mm., strongly bluish-grey-pollinose, the median vitta linear, scarcely broadened on posterior margins. A few northern and alpine specimens are dark-brown-pollinose.

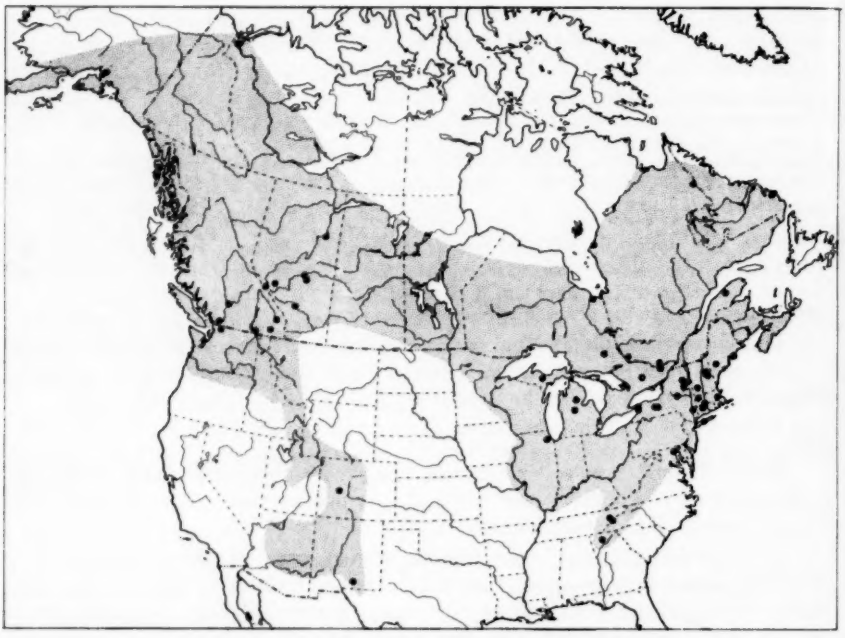
Legs.—Black, at most the fore knees yellow. F_2 avs. with three or four setulose bristles on basal third, then three (rarely two) strong, widely spaced, spinose bristles equal to femoral width on median third, preapically with a comb of six bristles; pvs. with basal setulose, then a strong even row equal to femoral width on basal two-thirds, apically with seven or eight shorter in a loose comb, a few ventral bristles on median third. T_2 faintly twisted and flattened on basal half, slightly enlarged apicad; ventral mat as a single row basad, as long as tibial diameter and irregular apicad; two or three ads., one pd. at apical fourth. F_3 with three or four strong preapical avs., with gradually shorter, erect setae to base; pvs. as irregular short setulae to apex. T_3 with no av., one or two ads., without the preapical dorsal.

Hypopygium.—Cercal plate short, rounded apically. Surstylus bifurcate, with a slender, incurving ventral arm and a broad, medially inclined dorsal arm. Bacilliform process strong, distinctly spiralled basally, with a long pointed apical portion.

Female

Head.—Parafrontals evenly grey-pollinose, one-third as broad as long. Parafrontal setulae strong. Occipital bristles regular. Postoccipital bristles absent.

Thorax.—Acr. biserial, strong. Mesopleurals stronger dorsad with two strong at both anterodorsal and posterodorsal corners, a few setulae between.



Map 41. Geographic distribution of *F. sociella* (Zett.).

Stigmatal setulae one or two. Squamae yellowish, the margin distinctly darker. Haltere yellow. Wing veins brown.

Abdomen.–Evenly and moderately pollinose throughout.

Legs.–F_1 pvs. decreasing only slightly basad. T_2 with one or two ads., one pd. F_3 with three to five strong preapical avs. T_3 with one av., two or three ads., two d's.

Type locality and type

Dania (Denmark). Type in Zoologiska Institution, Lund, Sweden (Stein, 1895; Ringdahl, 1939).

Type locality of *parallela*: Ithaca, New York. Type in Cornell University collection.

Remarks

The adults have been found associated with aphid-infested plants.

Records, 104 ♂♂, 68 ♀♀ (Map 41)

NORTHWEST TERRITORIES. Aklavik, 1 ♀. ALASKA. Juneau, 1 ♂; Sitka, 1 ♂; Muir Inlet, 2 ♂♂; Matanuska, 2 ♀♀ (ex soil cage), 1 ♂; Nebesna, 1 ♀; Anchorage, 1 ♂, 2 ♀♀. BRITISH COLUMBIA. Coldstream to Downie Creek, Selkirk Mts., 1 ♂; Robson, 2 ♂♂, 2 ♀♀; Agassiz, 2 ♂♂; St. Mary's, 1 ♀; Canim Lake, 1 ♂. ALBERTA. McMurray, 1 ♂, 1 ♀; Bilby, 2 ♀♀; Mt. Edith Cavell, Jasper Park, 1 ♀; Edmonton, 1 ♂; Cooking Lake, 1 ♂. WASHINGTON. Glacier, 1 ♀. COLORADO. Gothic, 1 ♀. NEW MEXICO. Cloudcroft, 1 ♀. MICHIGAN. Sescommon Co., 1 ♂; Midland Co., 1 ♂; Isle Royale, 1 ♀; Mar-

quette Co., 1 ♂. WISCONSIN. Wittenberg, 1 ♀; Rib Mt. St. Park, 1 ♀. ILLINOIS. Algonquin, 1 ♂. LABRADOR. Cartwright, 1 ♀. QUEBEC. Great Whale R., 1 ♀; Indian House, 2 ♀♀; Laniel, 24 ♂♂, 3 ♀♀; Baie Comeau, 2 ♀♀; Mt. Albert, 1 ♂. ONTARIO. Moosonee, 1 ♂; De Grassi Pt., 1 ♂; Thunder Bay Beach, 1 ♂; Maynooth, 3 ♀♀; Westree, 1 ♀; Merivale, 1 ♂; Niagara Falls, 3 ♂♂; Niagara Glen, 1 ♀; Midland, 3 ♂♂, 19 ♀♀. MAINE. Mt. Cadillac, 1 ♂, 1 ♀; Casco, 1 ♂. NEW HAMPSHIRE. Mt. Washington, 6 ♂♂; Franconia, 3 ♂♂; Glen House, 2 ♂♂; White Mts., 12 ♂♂, 1 ♀; Halfway House (to Gorham), 1 ♂; Mt. Adams (49-5400 ft.), 1 ♂, 1 ♀. CONNECTICUT. Canaan, 1 ♂, 2 ♀♀. MASSACHUSETTS. Sharon, 1 ♂; Chester, 1 ♂; Mt. Greylock, 2 ♂♂. VERMONT. Manchester, 1 ♂. NEW YORK. Ithaca, 12 ♂♂ (including holotype and one paratype of *parallela* Joh.), 2 ♀♀; Otter Lake, 2 ♀♀; Greene Co. (2500 ft.), 1 ♀; Geneva, 1 ♂; Whiteface Mts., 7 ♂♂; Wilmington Notch, 1 ♂; Lake Tear, Essex Co., 1 ♂, 1 ♀; Cold Spring Harbor, L.I., 4 ♂♂; Wells, 3 ♂♂; Artist's Bi., Essex Co., 1 ♀. PENNSYLVANIA. Dubois, 1 ♂, 1 ♀; Mineral Spring, 1 ♂; Roxborough, 4 ♂♂, 3 ♀♀. MARYLAND. College Park, 1 ♂; Chesapeake Beach, 1 ♂. TENNESSEE. Newfound Gap, Smoky Mts. (5000-5200 ft.), 1 ♂; Gatlinburg, G.S.M.N.P. (5500 ft.), 1 ♀, (3000 ft.), 1 ♀. NORTH CAROLINA. Highlands (3800 ft.), 2 ♀♀. GEORGIA. Blood Mts., 2 ♂♂.

I have seen and examined the holotype and one paratype of *parallela* and can find no differences between them and typical *sociella*. I have also seen several specimens of *sociella* from Sweden, Germany, and Switzerland.

Fannia ochrogaster (Thomson)

Figs. 121, 124, 202

Anthomyia ochrogaster Thomson, 1868, p. 557.
Fannia ochrogaster, Malloch, 1924a, p. 418.
Homalomyia splendida Stein, 1897, p. 170.
Fannia splendida, Stein, 1920, p. 45; Malloch, 1924a, p. 424; syn. *teste* Stein, 1920, and Malloch, 1924a.

This species is morphologically very similar to *sociella*, but in coloration resembles *pretiosa*, in that the abdomen is largely yellow. This species replaces *sociella* in the southwest. Length 5.0-6.0 mm.

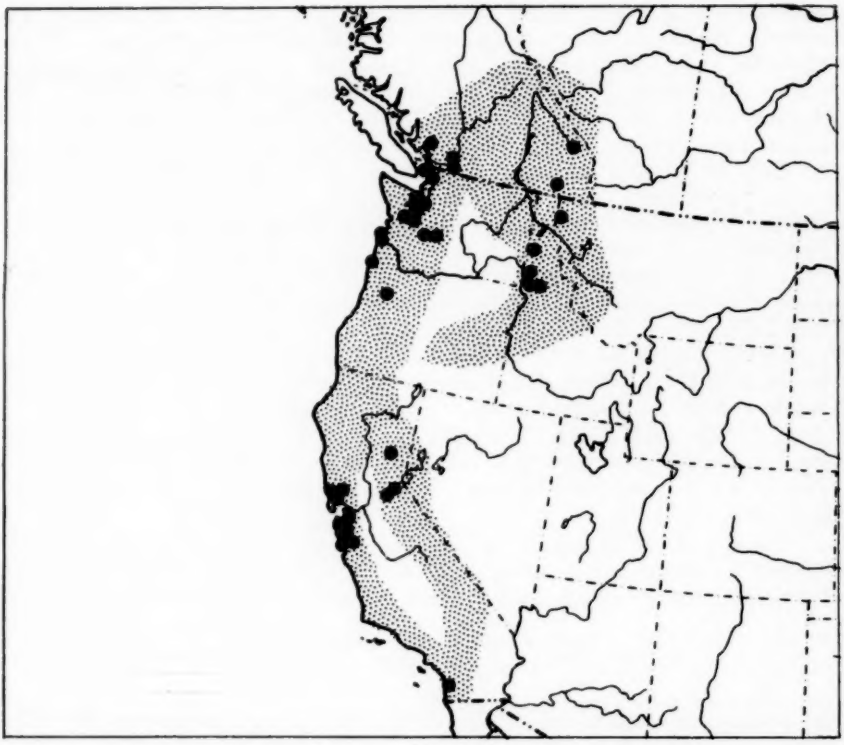
Male

Head.—Frontal bristles nine to 12, even. Parafrontals greyish-white, linear. Occipital bristles even, short. Postoccipital bristles absent. Antenna black, second segment yellow.

Thorax.—Acr. biserial, strong. Accessory setulae long, sparse. Pra. one, strong. Stigmatal setulae two to five. Mesopleurals with dorsal row only slightly stronger, a few bristles anterodorsally. Squamae brownish, margin darker. Haltere yellow. Wing veins brown.

Abdomen.—1.4 by 2.7 mm., very variable in distribution of black, main portion pellucid yellow. Normally largely pellucid on first four segments with a dark, broadly triangular, median vitta, fifth segment largely black, sometimes the apical half of second and all of fifth black, remainder yellow; or black from middle of third segment to apex, with base and a small median area on fourth yellow.

Legs.—F_2 with five or six setulose bristles on basal third, two (rarely three) strong on median third, and five or six in a comb preapically; pvs. with basal long and strong, continued strong and longer than femoral width on basal two-



Map 42. Geographic distribution of *F. ochrogaster* (Thoms.).

thirds, then five in preapical comb; ventral row strong on most of femoral length. T_2 as in *sociella*. F_3 usually with two preapicals strong, erect setulae basad; pvs. as irregular short setulae on basal half. T_3 with six to eight avs. and pvs. on apical half, ventral setulae strong, two strong ads.

Hypopygium.–Cercal plate slender, elongate, apically rounded. Surstylus bifurcate, with a long, slender, weakly incurved, ventral arm and a short, slightly broader, incurved, dorsal arm. Bacilliform process absent or very weak.

Female

Head.–Parafrontals grey-pollinose, one-third as broad as long. Parafrontal setulae strong. Occipital bristles regular. Postoccipital bristles absent. Second antennal segment and palpus yellow.

Thorax.–As in the male, with prothorax yellowish.

Abdomen.–Pellucid yellow, weakly pale-pollinose.

Legs.–Yellow, except tarsi. F_1 pvs. a full row, decreasing basad, but never setulose. T_2 with one or two ads., one pd. F_3 with two or three strong preapical avs. T_3 with two avs., two ads.

Type locality and type

California. Type in Riksmuseum, Stockholm, Sweden.

Type locality of *splendida*: Craig Mt., Idaho. Type in Chicago Natural History Museum.

Records, 68 ♂♂, 90 ♀♀ (Map 42)

BRITISH COLUMBIA. nr. Haney (1100 ft.), Garibaldi Peak, 1 ♂; Butchart, Vancouver I., 1 ♂; Victoria, 1 ♀; Squamish, Diamond Head Trail (3600 ft.), 2 ♂♂; Mission City, 1 ♀; Robson, 1 ♀; Yoho National Park (4400 ft.), 1 ♀. WASHINGTON. Shelton, 5 ♂♂; Ocean Park, 4 ♂♂, 2 ♀♀; Pt. Gamble, 1 ♂; Friday Harbor, 4 ♂♂, 3 ♀♀; Tacoma, 1 ♂, 40 ♀♀; Fort Lewis, 1 ♂; Mt. Vernon, 1 ♂; Mt. Baker, Skyline Trail, 1 ♀; Deschutes R., 1 ♂; Bellingham, 1 ♂; Vashon, 2 ♀♀; Burton, 1 ♂, 2 ♀♀; Ilwaco, 4 ♂♂, 1 ♀; Ashford, 1 ♂; Quilcene, 2 ♂♂, 1 ♀; Seattle, 2 ♂♂, 1 ♀; Mt. Rainier, 1 ♂, 1 ♀; Pluvius, 1 ♂. IDAHO. Craig Mt., 1 ♂ (holotype of *splendida*); Harrison, 1 ♂; Moscow Mt., 1 ♂, 4 ♀♀; Bovill, 1 ♀; Viola, 1 ♀. MONTANA. Troy, 1 ♂. OREGON. Boyer, 3 ♂♂, 1 ♀; Neskowin, 1 ♂, 2 ♀♀; Salem, 1 ♂, 1 ♀; Silver Creek Falls, Marion Co., 1 ♀. CALIFORNIA. San Francisco, 1 ♂; Snowline Camp, Eldorado Co., 4 ♂♂; Berkeley, 3 ♂♂, 7 ♀♀; La Honda, San Mateo Co., 2 ♂♂, 2 ♀♀; Santa Cruz, 2 ♂♂; Santa Cruz Mts., 6 ♂♂, 1 ♀; Felton, Santa Cruz Co., 1 ♂; Bolinas, 1 ♂; Mesa Grande, Sonoma Co., 1 ♂; Muir Woods, 1 ♂; Sequel, 2 ♀♀; Inverness, Marin Co., 2 ♀♀; 3 mi. S. Camino, Eldorado Co., 1 ♀; Clio Plumas Co., 2 ♀♀; San Diego, 1 ♀; Brooklyn, 1 ♂; Pepperwood, 1 ♂; Smith R., 1 ♂; Muir Woods, 6 ♀♀.

aerea subgroup

Fannia aerea (Zetterstedt)

Figs. 125, 127, 200

Aricia aerea Zetterstedt, 1845, p. 1605.
Homalomyia aerea, Stein, 1895, p. 70; Pandellé, 1899, p. 195; Wingate, 1906, p. 280.
Fannia aerea, Stein, 1907a, p. 565; Schnabl, 1911, p. 89; Malloch, 1912a, p. 178; Stein, 1913, p. 25; Stein, 1916, p. 81; Kramer, 1917, p. 40; Séguy, 1923, p. 268; Malloch, 1924a, p. 417; Malloch, 1924b, p. 518; Karl, 1928, p. 54; Ringdahl, 1928, p. 26; Aubcent, 1932, p. 365; Ringdahl, 1934a, p. 118; Tiensuu, 1935, p. 44; Tiensuu, 1936, p. 165; Karl, 1937, p. 128; Aczél, 1938, p. 172; Aubrook, 1939, p. 88; Aczél, 1940, p. 33; Ringdahl, 1944a, p. 17; Ringdahl, 1950b, p. 117; Lundblad, 1950, p. 208; Ringdahl, 1951, p. 167; Kidd, 1953, p. 138, Text Fig. 7; Ringdahl, 1954a, p. 76; Collin, 1958, p. 90, 92.
Anthomyia aerea, Meigen, 1826, p. 157 (misdetermination of *Musca aërea* Fallén).
Anthomyza aerea, Zetterstedt, 1838, p. 686 (misdetermination of *Musca aërea* Fallén).
Homalomyia aeria, Meade, 1897, p. 63.
Homalomyia carbonaria Rondani (nec Meigen), 1870, p. 324; Rondani, 1877, p. 53; Meade, 1882, p. 205; syn. *teste* Stein, 1895.
Homalomyia rondanii Strobl, 1893, p. 241; *nomen novum* for *carbonaria* Rond. (preocc.).
Fannia rondanii, Hennig, 1955, p. 79, Figs. 46, 86.
Fannia crassipes Malloch, 1912a, p. 179 (conditional name for misdetermination).

This species is distinguished from all its relatives by the strong male mid-metatarsal thorn, fully triserial acrosticals, very dark color, and the narrow female parafrontals. It is most closely related to the Palaearctic *parva,* less closely to the Nearctic *serrata.* From the description, *verrallii* Stein also belongs to this group. Length 3.5-4.0 mm.

Male

Head.—Frontal bristles six to eight, irregular, often restricted to anterior two-thirds. Parafrontals linear, dark-brownish-pollinose. Parafacials linear, not visible in lateral view. Occipital bristles short, regular. No postoccipital bristles. Antenna with third segment only half again as long as broad. Theca short, subshining, moderately sclerotized.

Thorax.—Acr. evenly triserial. Accessory setulae moderate in number, short. Pra. two, the posterior one slightly smaller. Mesopleurals scarcely

stronger dorsad. Stigmatal setulae absent. Squamae and haltere black. Wing veins dark, membrane distinctly darkened.

Abdomen.–Broad, 1.3 by 1.8 mm., thick brownish-grey-pollinose, slightly bluish on fifth segment, median vitta broadly but indistinctly triangulated, linear on fifth segment.

Legs.–Black, at most the foreknees yellowish. F_2 distinctly constricted preapically; avs. with seven widespaced on basal half (three bristles 1.5 times femoral width, then four equal to femoral width), then four shorter and closer set, and preapical comb of four or five; pvs. a full row of longer bristles, doubled ventrally on median third, decreasing to a short, tight, preapical clump of five. T_2 basally compressed, with a weak posteroventral carina, slightly thickened on apical half; ventral mat setulose basad, thickening apicad to a distinct mat as long as half the tibial diameter; one ad., no pd. Mt_2 with distinct, curved, thornlike crest. F_3 avs. continued as very short setulae to apex, no strong preapical bristles; pvs. setulose basad, increasing gradually to preapical bristles as long as femoral width. T_3 with one av., one ad.

Hypopygium.–Cercal plate strongly modified, broad and short, with a pair of sharply pointed subbasal processes and an apical ventral pair of rounded processes. Surstylus basally broad, apically sharply turned upwards. Bacilliform process slender, short, curved.

Female

Head.–Parafrontals brownish-pollinose, only one-fourth as broad as long and scarcely convex on inner margin. Occipital bristles short, regular. Postoccipital bristles absent.

Thorax.–Acr. evenly triserial, median row weaker. Mesopleurals with dorsal row weak but distinct. Wing veins yellow-brown. Squamae and haltere yellowish.

Abdomen.–Evenly but lightly pollinose throughout, subshining.

Legs.–F_1 pvs. with distinctly strong preapical, shorter on apical half, basally setulose. F_3 avs. setulose, with only two preapicals strong; pvs. setulose on basal half.

Type locality and type

Not known. Type in the Zetterstedt collection at Lund, Sweden (seen by Stein, 1892b).

Type locality of *rondanii* (= *carbonaria*): Piemonte, Italy. Type location not known.

Remarks

The correct name for this species has been subject to much controversy (Stein, 1895; Hennig, 1955; Collin, 1958). Hennig resurrected *rondanii* Strobl, considering that Zetterstedt's and Meigen's use of the name "*aerea*" was due to erroneous determination. However, in Diptera Scandinavia, Vol. 4, Zetterstedt states that *aërea* Fallén (217) was described from a mixed series, and establishes that true *aërea* has lateral abdominal spots. He then describes *aerea* (220), distinguishes it from *aërea* (217), and refers part of Fallén's material, both of Meigen's references, and his own 1838 reference in part to this latter species. He consistently spells *aërea* (217) with the dieresis, and *aerea* (220) without it. There is no doubt, therefore, that Zetterstedt recognized *aerea* (220) as a distinct

species from *aërea* Fallén, listed diagnostic characters for both, and indicated the difference by omitting the dieresis on the name of the second species.

However, Zetterstedt complicates the situation by crediting the name to Meigen, who consistently referred to *aerea* Fallén. Meigen undoubtedly had specimens of *aerea* (220) of Zetterstedt (Stein, 1900), but does not indicate that he realized it was different from *aërea* Fallén. Therefore Meigen's use of *aerea* must be considered either as an invalid emendation or (more likely) an erroneous subsequent spelling of *aërea*. As such, it should have no standing in nomenclature.

Zetterstedt, therefore, in distinguishing between *aërea* Fallén (217) and *aerea* (220), in fact described *aerea* (220) as a new species with a distinct, unpreoccupied name. As Collin points out, the names have entirely different meanings. The name *aërea* is derived from *aer* (the air), and *aerea* from *aereus* (of copper or bronze). It is apparent however, that Zetterstedt believed he was only following Meigen in so referring to the second species. I am firmly of the opinion that the name should be credited to Zetterstedt.

The use of *aerea* Zetterstedt is however likely to be invalidated by the most recent Rules of Nomenclature which state that diacritical marks are to be omitted from specific names. The dieresis, while not properly a diacritical mark, may be considered under the rules to be such, and if so, then *aerea* must fall as a primary homonym of *aërea*, despite the different roots of the two names.

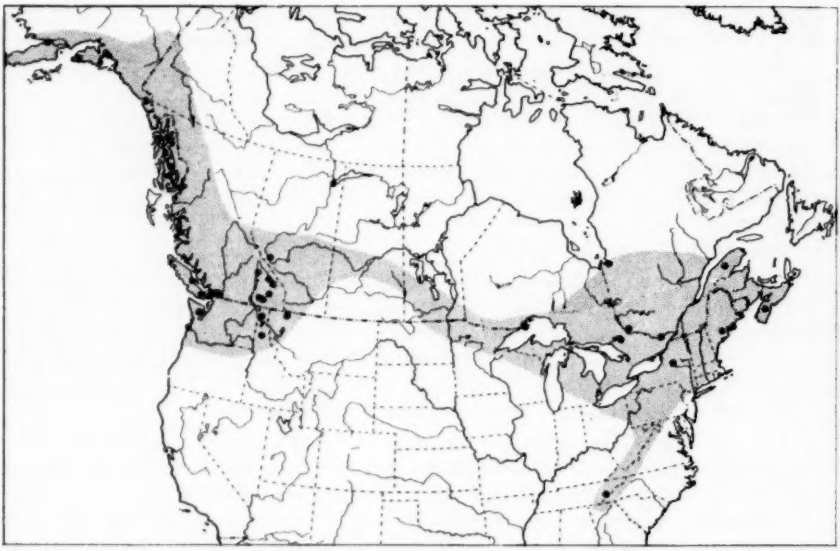
The alternative is to use *rondanii* Strobl, which was proposed as a new name for *carbonaria* Rondani, and hence the type of *rondanii* must be, under the rules, the type of *carbonaria* Rondani. Stein (1895) only tentatively synonymized *carbonaria* Rondani with *aerea* Zetterstedt, stating that specimens so identified were of two very similar species. To my knowledge, the type has not been examined and may be lost. Until the identity of the type of *carbonaria* Rondani can be determined, I am very hesitant to accept the synonymy, and use *rondanii* as the correct name for *aerea* Zett.

If it should prove to be of a different species, and *aerea* Zetterstedt is classified as a primary homonym under the Rules, then it will be necessary to propose a new name.

The most practical approach at present is to consider *aerea* Zetterstedt as a valid name (the type is in existence), at least until the Rules concerning the significance of the dieresis in homonymy are clarified.

Records, 10 ♂♂, 92 ♀♀ (Map 43)

ALASKA. On tundra, Naknek, 1 ♂, 1 ♀; Anchorage, 2 ♀♀. BRITISH COLUMBIA. Fairmont, 1 ♀; Invermere, 1 ♀; Robson, 1 ♂, 10 ♀♀; Duncan, 1 ♂; Ruskin, 2 ♀♀; Brilliam, 1 ♀; Kaslo, 1 ♀; Carbonate, Columbia R., 1 ♂, 7 ♀♀; Downie Creek, Selkirk Mts., 1 ♀; Big Qualicum R., Qualicum, 10 ♀♀. ALBERTA. Chipewyan, 3 ♀♀; Jasper, 1 ♀. WASHINGTON. Ilwaco, 2 ♀♀; Orcas Island above Mt. Lake, 1 ♀; Lake Cushman, 1 ♀. IDAHO. Priest Lake, 2 ♀♀; Laird Park, nr. Harvard, 13 ♀♀. MONTANA. Lake McDonald, Glacier Park, 1 ♀; Gallatin Mts. (5000 ft.), 1 ♀. MICHIGAN. Isle Royale, 1 ♂. QUEBEC. Mt. Albert, 1 ♂, 2 ♀♀; Rupert House, 2 ♀♀; Buckingham, 1 ♀; Laniel, 11 ♀♀. NOVA SCOTIA. Kentville, 1 ♂. ONTARIO. Westree, 1 ♂, 11 ♀♀; Gold Rock (Rainy River District), 1 ♂, 1 ♀. MAINE. Pittston, 1 ♀; Seal Harbor, 1 ♀. NEW YORK. Raquette Lake, 2 ♂♂. TENNESSEE. Gatlinburg, G.S.M.N.P. (4000 ft.), 1 ♀; (5500 ft.), 1 ♀. NORTH CAROLINA. Highlands (3800 ft.), 1 ♀.



Map 43. Geographic distribution of *F. aerea* (Zett.).

I have examined also 4 ♂♂, 8 ♀♀ from England, Sweden, Austria, and Greece.

Fannia serrata, new species

Figs. 126, 128

This species, on the basis of the male genitalia, appears to be a member of the *aerea* subgroup, with a pair of projecting lobes on the cercal plate. The lower squama is faintly lobate, the mid metatarsus lacks any basal crest, and the hind femur has four or five strong medial anteroventral bristles and one strong preapical one. Length 4.5-5.0 mm.

Male

Head.—Frontal bristles four to six, restricted to the anterior half of the parafrontals. Parafrontals contiguous on upper half, linear (0.02 increasing to 0.06 mm.), dull silvery. Parafacials very narrow, hidden in profile by the anterior margin of the eye. Genae in profile 0.06 mm. Eyes in profile 1.06 mm. high. Otherwise as in *aerea*.

Thorax.—Acr. evenly triserial. Accessory setulae short, moderate in number. Pra. one, short but strong, with no trace of a second bristle. Mesopleurals slightly stronger dorsad. Stigmatal setulae absent. Squamae and haltere brownish-yellow. Lower squama faintly lobate, margins of both squamae darker. Wing veins medium brown, membrane slightly browned.

Abdomen.—Broad, 1.2 by 1.8 mm., thick brownish-grey-pollinose. Partially greased, but apparently identical in markings to *aerea*.

Legs.—Black, at most fore knees yellowish. F_2 moderately constricted apicad, the bristles less differentiated; avs. with two strong basally, longer than femoral diameter, then eight shorter (about femoral diameter) extending to apical fourth, then a short comb of five or six; pvs. as a full row of longer bristles, duplicated ventrally on median third, changing rapidly at three-fourths to a short tight

clump of five. T_2 basally compressed, with a posteroventral carina extending to apical third, and becoming stronger apicad, the apical third thickened to almost twice basal diameter; ventral mat indistinct on basal half, distinct and as long as basal tibial diameter on apical half; one ad., one pd. Mt_2 with no basal crest. F_3 avs. basally setulose, gradually increasing to two-thirds femoral diameter at two-thirds, a bare space, and a strong preapical; pvs. erect and setulose, becoming stronger apicad but never more than half femoral diameter, absent on apical third. T_3 with one av., one ad.

Hypopygium.—Cercal plate broad and short, with a sublateral pair of rounded flattened processes and with sharp, heavily sclerotized teeth on the apical ventral margin. Surstylus bifurcate, with a small ventral arm and a long slender dorsal arm. Bacilliform process absent or very weakly developed.

Female

Not known with certainty.

Type

Holotype.— ♂, Ringwood, Ithaca, New York, 13.VII.1920 (M. D. Leonard) (C.N.C. No. 6681).

canicularis Group

This is one of the two groups recognized by Hennig, who listed the following group characters: upper orbital bristle more or less distinctly developed in the male, hind coxa posteroventrally with one or more bristle hairs, and the surstylus extending from the inner margin of the ninth tergum. Among the species he listed as belonging to this group were the Holarctic species *canicularis*, *difficilis*, and *glaucescens*.

On a Nearctic basis, it is advisable to extend the *canicularis* group to cover a wider scope. Three divisions can be recognized, the *canicularis*, *glaucescens*, and *pusio* subgroups. The *canicularis* subgroup would include all of Hennig's species except *glaucescens*, which is aberrant. In the Nearctic region, two additional species, *laevis* and *latifrons*, can be grouped with *glaucescens* to form a separate subgroup. The third subgroup was recognized and revised by Seago. Of this subgroup, one species, *leucosticta*, is Palaearctic, whereas the other species, *pusio*, *femoralis*, *howardi*, *snyderi*, *dodgei*, *sabroskyi*, and *trimaculata* are confined to the New World. The last three of these species are Neotropical, the others are predominantly Nearctic. They differ from the two previous subgroups in that the males lack the upper orbital bristle and have a trimaculate abdominal pattern. However, in leg bristling, female head structure and bristling, and the structure of the cercal plate and surstyli of the male genitalia, they resemble very closely the *canicularis* subgroup. In puparial structure as well the close relationship is indicated.

There is considerable evidence to suggest that the genera *Euryomma*, *Platycoenosia*, and *Piezura* are most closely related to this group of the genus *Fannia*.

The *canicularis* group in the broad sense can be recognized by the following characters: the female parafacials bear from one to several setulae on the upper half and the hind tibiae usually bear a partial row of anterodorsal bristles, of which only one or two are strong. The squamae are large, the lower distinctly projecting. The hind coxae bear one or more setulae. The male genitalia are most distinctive. The cercal plate is weakly developed and narrow medially. The surstylus extend next the cercal plate, and a ventrolateral projection on each bears a clump of weak bristle hairs. No bacilliform processes are present. The

ninth sternum is strongly broadened, particularly at the basal angles, and the postgonites are strongly sclerotized and large.

The larvae are also characteristic. The dorsal processes are usually well developed. The posterior spiracles are set medially on distinct stalks and the spiracular slits are on lateral projections which are approximately at right angles to each other. The lateral processes, best developed on the terminal segment, have projections developed on only the basal fourth. In all species of which the larvae are known, eight prothoracic spiracular processes are present on each side.

The *canicularis* subgroup in the Nearctic region includes the following species: *canicularis, nidicola, subpubescens, difficilis, morrisoni, variabilis, tibialis, pallidiventris, ceringogaster, alaskensis,* and *binotata.* These species share these further characters in addition to those noted in the above diagnosis: the upper orbitals are present in the male, the abdominal vitta where distinct is triangulated in outline without lateral spots, the hind femora bear full rows of posteroventral hairs or setulae, and the hind tibiae bear several anteroventral bristles (except in *difficilis*). The postgonites are heavily sclerotized and triangular in shape, and the aedeagus is membranous.

The *glaucescens* subgroup is characterized as follows: the upper orbitals are present in the male, the abdominal vitta is parallel-sided and lacks lateral spots, the hind femora lack posteroventral bristles on the apical fourth, and the hind tibiae bear single anteroventral and anterodorsal bristles. The aedeagus is distinctly sclerotized.

The *pusio* subgroup includes *pusio, leucosticta, femoralis, howardi,* and *snyderi.* The males lack the upper orbitals and have a trimaculate abdominal pattern, the hind femora are often somewhat enlarged preapically with a cluster of bristles on the raised area, and the hind-tibial bristling is variable. The aedeagus is surrounded by a strong sclerotized process which projects strongly dorsad. The female abdomen, except in *leucosticta,* is almost entirely glossy (pollinose in the other subgroups).

canicularis subgroup

There are two weakly separable complexes in this subgroup, one typified by *canicularis,* with a moderately developed row of T_2 ads., a simple row of F_3 pv. setulae, and no strong bristles on the hypopygium at the base of the surstyli; and the other by *difficilis,* with only one T_2 ad., numerous ventral and posteroventral hairs on F_3, and numerous bristles on the hypopygium at the base of the surstyli.

The general description of the *canicularis* subgroup is as follows:

Male

Head.—Frontal bristles many, strong and regular, tending to be somewhat reduced in the *difficilis* complex. Upper orbital bristle present (a character shared only with the *glaucescens* subgroup). Parafrontals variable in breadth and pollen color, separated usually by a broad and distinct black frontal vitta. Parafacial setulae normally absent, present but weak in a few species. Occipital bristles short and regular. Postoccipital bristles absent. Second antennal segment with one strong bristle, third segment variable in shape. Arista bare to distinctly pubescent. Palpus long, only faintly spatulate; theca pollinose, not expanded, weakly sclerotized.

Thorax.—Variable in color, but if light-pollinose, usually distinctly vittate along the bristle rows. Acr. bristles irregularly triserial, tending to be quadri-

serial postsuturally, occasionally quadriserial throughout. Accessory setulae moderate, the intraalars in a single row. Prealar bristles variable from one to four, normally setulose, but in most of the *difficilis* complex occurring as one or two strong short bristles. Stigmatal setulae few or none. Propleuron bare (as in other species groups) except in two species, in which a variable number of setulose hairs is present. Mesopleural setulae moderate in extent, dorsal row fairly well differentiated. Scutellum bare discally. Squamae subequal, the lower distinctly projecting, variable in color. Haltere yellow. Wing color variable.

Abdomen.—Normally three-fifths as broad as long, rarely much narrower. Integumental color entirely dark to entirely yellow. Pollen thickly brown-pollinose to weakly whitish-pollinose, the latter condition correlated with yellow integumental color; median vitta, if visible, distinctly triangulated.

Legs.—Black to yellow. F_1 with a full row of pvs., weaker on basal half. T_1 usually not bristled. C_2 normal. F_2 with av. row weak and undifferentiated in the *canicularis* complex, fairly well differentiated with the preapical comb and ventral area somewhat doubled in the *difficilis* complex; pv. row variable from weakly duplicated medially to strongly duplicated or even somewhat tripled medially. T_2 evenly thickened to apex, hair mat evenly short and dense, one ad., one pd. C_3 with two or three bristles. F_3 with avs. usually weak, at most one-third as long as femoral width medially, two or three preapicals strong; pvs. with a full row of setulae, long and duplicated ventrally in the *difficilis* complex. T_3 avs. one to four, ads. variable from a full row to a single strong medial bristle, pvs. absent.

Hypopygium.—Ninth tergum evenly bristled or with a distinct cluster of long hairs above the base of each surstylus. Cercal plate slender, weakly developed. Surstylus with the main process on the inner margin flat and approximately parallel-sided; with a weaker ventrolateral process usually present, flattened, and bearing apically a clump of short setulae. Bacilliform process completely absent. Ninth sternum broad, heavily sclerotized, with inwardly projecting basal processes; postgonites large, hornlike, heavily sclerotized, enclosing the completely membranous aedeagus. Fifth sternum as long as broad, the bristles not or scarcely crowded toward posterior margin and not distinctly differentiated.

Female

Head.—Parafrontals distinctly pollinose, one-third as broad as long, setulae usually uniserial. Parafacials with a distinct reflecting spot opposite the antennal base, and with a row of fine setulae on the dorsal half. Occipital bristles short, regular. Postoccipital bristles absent. Antennae and mouth parts as in the male.

Thorax.—As in the male, the setulae usually shorter.

Abdomen.—Unicolorous yellow to black, or black with the basal segments yellow, pollen usually faint.

Legs.—Much as in the male but bristling generally weaker. F_2 bristling weaker; avs. usually setulose, except for one to three strong and erect subbasally; pvs. setulose, with a more or less strong basal bristle. F_3 avs. setulose except for two or three strong preapicals, pvs. setulose.

Ovipositor.—Subanal plate usually as broad or broader than long, evenly setulose from base. Eighth tergum usually well developed, sometimes extending well onto the ventral surface (cf. *difficilis*); eighth sternum reduced to an anterior pair of small setulose plates and a weak posterior pair of bare lateral

plates, the posterior pair sometimes absent. Seventh segment long, well developed, the sternum as long as or longer than broad. Sixth segment usually distinctly smaller than seventh, the sternum usually broader than long, the tergum usually enclosing the last two pairs of spiracles (rarely the posterior pair is just posterior to the tergum in the membrane). Spermathecae two, spherical or apically flattened, smooth surfaced, with a short, slender, weakly sclerotized duct base.

Larva

Only known for *canicularis*. See specific description.

Biology

The biology of *canicularis* is very well known, since the larvae are implicated in various cases of myiasis and the adults are commonly known as the little or lesser house fly from their frequent occurrence in houses. *F. canicularis* has also been found in a wide variety of decaying vegetable and animal matter, including excrement. Several of the species of this subgroup are known from bird and animal (including insect) nests, and have been reared from mushrooms of the genera *Boletus*, *Amanita*, and *Polyporus*.

Distribution

The subgroup is very widely distributed in the Holarctic region, and *canicularis*, due to its association with man, is cosmopolitan. One species, *prisca* Stein, is known from India and China, whereas the other species are more northern in their distribution. Nevertheless none of the species is truly alpine or subarctic; the subgroup is known only from well south of treeline.

***Fannia canicularis* (Linné)**

Figs. 129, 129A-D, 203, 261, 271, 272, 283

Musca canicularis Linné, 1761, p. 454; Linné, 1787, p. 992; Fabricius, 1775, p. 779; Fabricius, 1781, p. 443; Schrank, 1781, p. 462; Fabricius, 1787, p. 346; Fabricius, 1794, p. 329; Fabricius, 1805, p. 303; Fallén, 1824, p. 69.

Anthomyia canicularis, Meigen, 1826, p. 143; Macquart, 1835, p. 334; Walker, 1853, p. 136; Taschenburg, 1880, p. 133.

Philinta canicularis, Robineau-Desvoidy, 1830, p. 568.

Anthomyza canicularis, Zetterstedt, 1838, p. 681.

Aricia canicularis, Zetterstedt, 1845, p. 1573.

Homalomyia canicularis, Schiner, 1862, p. 654; Loew, 1864, p. 317; Rondani, 1866, p. 132; Schiner, 1868, p. 298; Rondani, 1877, p. 48; Meade, 1878, p. 251; Meade, 1882, p. 202; Bigot, 1885, p. 284; Stein, 1895, p. 55; van der Wulp, 1896, p. 331; Stein, 1897, p. 171; Meade, 1897, p. 63; Pandellé, 1899, p. 189; Howard, 1900, p. 581; Enderlein, 1903, pp. 200, 254; Stein, 1904, p. 458; Aldrich, 1905, p. 537; Wingate, 1906, p. 280; Stein, 1908b, p. 194; Stein, 1910c, p. 198; Keilin, 1919, p. 448.

Fannia canicularis, Stein, 1907a, p. 657; Stein, 1908a, p. 98; Strobl, 1909, p. 240; Chevrel, 1909, pp. 369-450; Stein, 1910a, p. 556; Schnabl, 1911, p. 108; Hewitt, 1912, p. 161; Malloch, 1912a, p. 175; Stein, 1913a, p. 26; Stein, 1913b, p. 509; Portschinsky, p. 26, Fig. 8; Graham-Smith, 1914, p. 30; Hewitt, 1914a, p. 2; Hewitt, 1914b, p. 187; Stein, 1915b, p. 136; Atkinson, 1916, p. 147; Graham-Smith, 1916, pp. 440-554; Richardson, 1916, p. 408; Lodge, 1916, p. 481; Lodge, 1918, p. 141; Nocedo, 1918, p. 132; Wasmann, 1918, p. 130; Kobayashi, 1919; Keilin, 1919, pp. 430, 448; Wilhelmi, 1919, p. 261; Wilhelmi, 1920, p. 296; Kubo, 1920; Patton, 1921, p. 230; Miller, 1922, p. 335; Onorato, 1922; Illingworth, 1922a, p. 270; Brooks, 1922; Malloch, 1923, p. 605; Séguy, 1923, p. 268, Figs. 517, 537, 538; Falcoz, 1923, p. 263; Sack, 1923, p. 8; Séguy, 1924, pp. 135, 136; Bezzi, 1925, p. 21; Collin, 1925, p. 333; Illingworth, 1926a, p. 260; Illingworth, 1926b, p. 401; Falcoz, 1927, p. 232; Fischer, 1927, p. 399; Roubaud, 1927, p. 24; Charrier, 1926, p. 619; Ringdahl, 1928, p. 25; Karl, 1928, p. 53; Séguy, 1929, p. 71; Czerny, 1930, p. 116; Ringdahl, 1930, p. 4; Malloch, 1930, p. 305; Séguy, 1930, p. 158; Falcoz, 1930, p. 151; Regnier, 1931; Lindroth, 1931, p. 324; Séguy, 1932, p. 22; Lundblad, 1933, p. 35, Figs. 15-17; Cuthbertson, 1934, p. 32; Ringdahl,

1934a, p. 113; Malloch, 1934, p. 203; Schlegtendal, 1934, p. 562; Kadocsa, 1934, p. 444; Jack, 1935, p. 558; Séguy, 1935, p. 159; Tiensuu, 1935, p. 45; Karl, 1935, p. 40; Shinoda and Ando, 1935; Nieschultz, 1935a, p. 225; Nieschultz, 1935b, p. 416; Thomsen and Hammer, 1936, p. 559; Nordberg, 1936, pp. 46, 104, 120-139; Tiensuu, 1936, p. 165; Frey, 1937, p. 134; Timon-David, 1937, p. 11; Nelson, 1938, p. 128; Kobayashi, 1938, p. 477; Tiensuu, 1938, p. 8; Lörincz and Mihályi, 1938, p. 1; Henriksen, 1939, p. 87; Baranov, 1939, p 280; Orösi-Pál, 1939, p. 64; Aczél, 1940, p. 33; Séguy, 1941a, p. 23; Vanskaya, 1942, p. 562; Ringdahl, 1944a, p. 17; de Meijere, 1946, p. 19; Shillito, 1947, p. 291; James, 1947, p. 129; Frey, 1949, p. 104; Zangheri, 1950, p. 88; Hennig, 1950, p. 33; Brauns, 1950b, p. 155; Ringdahl, 1951, p. 166; Kabos, 1951, p. 127; Ringdahl, 1952, p. 156; Séguy, 1953, p. 87; Smith, 1954a, p. 3; Smith, 1954b, p. 2; Hennig, 1955, p. 32, Figs. 7, 66; St. Germaine, 1956a, pp. 12, 39, 54; St. Germaine, 1956b, p. 1; Westwood and Tuff, 1957, p. 65; Burnett et al, 1957, p. 433; Sytscherskaja, 1957, p. 111; Tilden, 1957, p. 24; Reed, 1957, p. 238; Lawrence, 1958, p. 167; Smith, 1958, p. 63; Barnes, 1958, p. 48; Somme, 1958, p. 599; Ogden and Kilpatrick, 1958, p. 611; Hicks, 1959, p. 212.

Musca minor domestica De Geer, 1776, p. 26; syn. *teste* Stein, 1907a.
Philinta pallipes Robineau-Desvoidy, 1830, p. 565; syn. *teste* Stein, 1907a.
Anthomyia fulvomaculata von Roser, 1840, p. 59; syn. *teste* Stein, 1907a.
Anthomyia constantina Macquart, 1843, p. 170; syn. *teste* Stein, 1907a.
Anthomyia chilensis Macquart, 1843, p. 171; Blanchard ap Gay, 1852, p. 442; syn. *teste* Stein, 1907a, p. 216.
Anthomyia isura Walker, 1849, p. 952; syn. *teste* Stein, 1901, p. 199; Huckett, 1934, p. 131.
?Anthomyia introducta Walker (p.p.), 1856, p. 362; syn. *teste* Stein, 1901, p. 199.
?Anthomyia tuberosa Curtis (p.p.), 1860, p. 463; syn. *teste* Stein, 1907a.
Homalomyia prunivora Walsh, 1869, p. 137; new synonymy.
Anthomyia muscoides Walker, 1871, p. 344; syn. *teste* Stein, 1907a.
Homalomyia mexicana Bigot, 1885, p. 284; Giglio-Tos, 1895, p. 27; van der Wulp, 1896, p. 332; Aldrich, 1905, p. 539; syn. *teste* Stein, 1907a.
?Homalomyia fucivorax Kieffer, 1898, p. 100; syn. *teste* Stein, 1907a.
Homalomyia fraxinea Hutton, 1901, p. 75; syn. *teste* Malloch, 1930.

This species has few close relatives in the Nearctic region, although there are several in the Palaearctic. With *nidicola* and *subpubescens*, it forms a complex characterized by a partial hind-tibial anterodorsal row of erect setulae and by setulose hind-femoral posteroventrals. From its two closest relatives, it can be identified by the vittate thoracic pattern, and basally yellowed abdomen. Partially distinctive are the bare parafacials and the short setulae on the thorax. Length 4.5-7.0 mm.

Male

Head.—Frontal bristles 10 to 13, with only a few interstitials. Parafrontals silvery-pollinose, moderately broad (0.04 increasing to 0.12 mm.), separated by a distinct (0.05 mm.) black frontal vitta. Parafacial setulae absent. Third antennal segment twice as long as broad. Arista subpubescent.

Thorax.—Rather variable in color, usually with a brownish-grey background with more or less distinct medium brown vittae along acrostical and dorsocentral rows, the brown more extensive laterally. Acr. bristles triserial presuturally, quadriserial on posterior fourth. Pra. two to four, usually setulose and irregularly placed. Stigmatal setulae none or one. Squamae whitish, margin yellowed. Wings clear.

Abdomen.—1.9 by 3.2 mm. Brownish-grey-pollinose, the median vitta distinct and triangulated. Second to fourth segments with the integument translucent yellow basally, often at least partially obscured by pollen.

Legs.—Black, knees and sometimes entire tibiae paler. F_2 pvs. uniserial, rather slender. T_2 ventral mat one-fourth as long as greatest tibial diameter. F_3 pvs. setulose throughout, distinctly erect basally. T_3 avs. two; ads. with one strong and several erect bristlelike setulae (usually three above and four below the median bristle), rarely a few posterior setulae erect.

Hypopygium.—Only a few short bristles at base of surstylus. Inner process of surstylus scarcely longer than basal width of surstylus; outer process broad, flat.

Female

Head.—Parafrontal and parafacial setulae uniserial. Third antennal segment half as broad as long.

Thorax.—Vittae usually paler, less distinct than in the male. Acr. usually more regularly triserial. Otherwise as in the male.

Abdomen.—All of second and lateral fourths of third are yellowish, remainder evenly purplish-brown, weakly pollinose.

Legs.—Usually paler, tibiae distinctly reddish. T_1 usually with a distinct but weak ad. F_2 avs. setulose, usually only one stronger at one-third; pvs. with a weak basal, then setulose to apex. T_3 with two avs., four to six ads.

Larva (Fig. 283)

Integument reticulate, with fine depressed lines dividing the surface into smooth polygonal areas. Laterodorsal processes strong, with four to eight pairs of simple lateral projections on basal third (projections weak or absent on those of thoracic segments); processes of caudal segment unequal, the sublateral distinctly shorter than other two. Lateroventral processes distinct, almost as well developed as laterodorsals (weak to absent on thoracic and caudal segments); dorsolaterals weak, usually trifurcate; dorsals strong, subequal in length to laterodorsals, the basal projections irregularly arranged, not distinctly lateral. Cephalic process of first thoracic segment short, lateral process absent. Anterior spiracular processes distinct, about eight in number. Posterior spiracular stalk situated on disc, moderately long; spiracular processes distinct, approximately at right angles to each other. Mouth hooks well developed.

Description based on numerous larvae and puparia from various North American localities; including specimens from nests of buzzard, herring gull, and meadow mouse; from bat guano caves, decaying fungus, celery waste, and human urinary tract.

Type locality and type

Given as "habitat ubique", restricted (see Hennig, 1955) to Uppsala, Sweden. Type location unknown.

Type locality of *chilensis*: Chile; of *neomexicana*: Mexico. Both types in Collin collection, Newmarket, England.

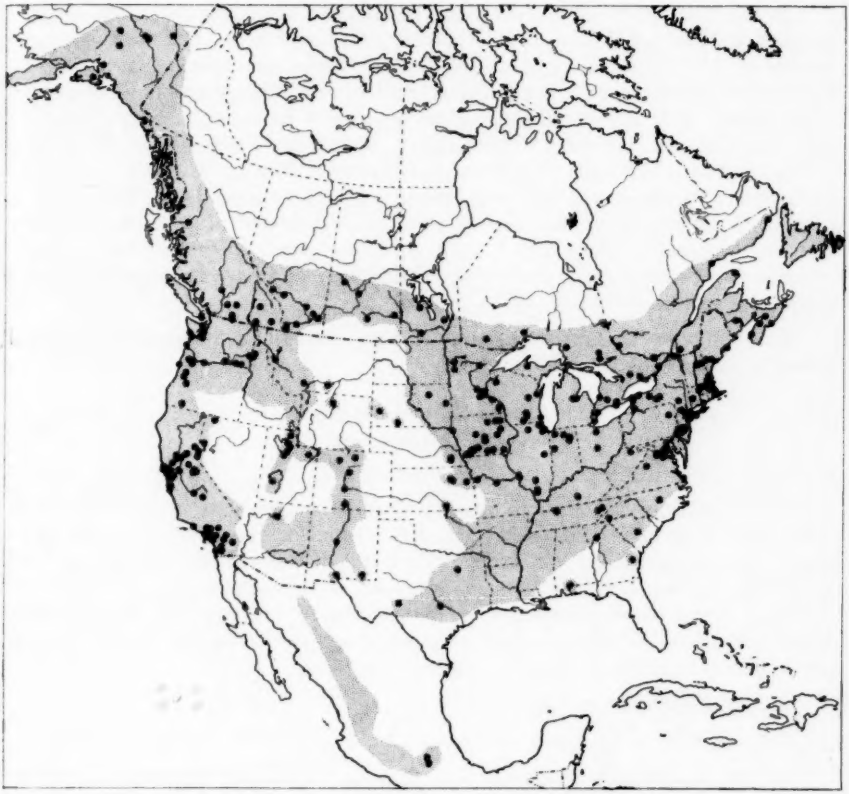
Type locality of *isura*: Nova Scotia. Type in British Museum, London, England.

Type locality of *prunivora*: not given; designated locality: Illinois. Location of type unknown.

Remarks

This species is almost as cosmopolitan as *Musca domestica* (for details see Hennig, 1955), and is commonly referred to as the "lesser" or "little house fly". It has apparently followed man around the world in the same manner as *Musca*, and has extended north well beyond the range of the house fly, so that in Iceland it is the only common house fly. It is a common late-summer pest of houses, barns, and chicken houses; normally found hovering near the ceilings.

In this region, the species is numerous in Alaska (Ladd, Fairbanks, Naknek, McKinley Park) and is known from Cameron Bay, Great Bear Lake, N.W.T.



Map 44. Geographic distribution of *F. canicularis* (L.).

From these northern extremes, the range of the species extends south and southeast throughout the inhabited areas of Canada and the United States into Mexico (Map 44).

It is probably capable of breeding in all the habitats recorded for the subfamily, although it apparently only establishes itself in areas of human habitation where decaying organic matter is easily available.

It has been recorded from several species of fungi (Falcoz, 1927, 1930), and from a wide variety of decaying vegetable matter such as iris buds (Kadocsa, 1914); cabbage stalks, sugar beets, decaying grass, rape stalks (Hewitt, 1912); decaying nasturtiums (Lawrence, 1958); and tomatoes (Nelson, 1938). I have seen specimens that have been reared from decaying plums, peas, corn, and onions. It is also known from manure (Smith, 1954b; St. Germaine, 1956a; Tilden, 1957) and other decaying animal matter, such as snails (Hewitt, 1912; Keilin, 1919; Mokrzecki, 1923), grasshoppers, and locusts (Séguy, 1932; Jack, 1935), and mammalian corpses (Illingworth, 1926b); and from high-protein food waste (Smith, 1958) and highly fertilized soil (Eastwood and Tuff, 1957). It has been recorded as a parasite of *Hyphantria cunea* (Dru.) (Hennig, 1955), of locusts (Nocedo, 1918; Regnier, 1931; Séguy, 1953), and of *Conotrachelus retentus* Say (Brooks, 1922).

It has been reared from the nests of *Bombus terrestris* (L.) and *Vespula germanica* (Fab.) (Meade, 1891; Hewitt, 1926) and from the nests of many species of birds (Nordberg, 1936; Hicks, 1959) and deer mice (Barnes, 1958). Specimens before me have been reared from squirrel, meadow-mouse, and kittiwake nests. It is known to live in the excrement of man (Hewitt, 1912); of pigs, chickens, and horses (Mellor, 1920); of rabbits and dogs (St. Germaine, 1956a); and of white mice (Thomsen and Hammer, 1936). The most important occurrences of the larvae are as myiasis-producers (James, 1947; West, 1951), causing 75 per cent of human cases of intestinal myiasis and many cases of urinary and aural myiasis. They are known to infest wool of sheep after primary infection by *Pollenia stygia* (Fallén) (Miller, 1922), and have been recorded from wounds of monkeys (Séguy, 1925).

Further notes on life history and biology may be found under the general notes on biology of the subfamily.

Fannia nidicola Malloch

Figs. 130, 130A, 204

Fannia nidicola Malloch, 1927b, p. 92 (Fig.); McAtee, 1927, p. 88.

This species is very close to *canicularis*, and has been separated strictly on its dark color, with nonvittate thorax and dark abdomen. Nevertheless, some specimens of *canicularis* are sufficiently dark to fit the above description. All specimens before me have brown-pollinose, narrower parafrontals, and the abdomen is so heavily pollinose as to completely obscure the median vitta. Moreover, there are one to eight parafrontal setulae below the lowest frontal, and opposite the base of the third antennal segment.

Lesser differences as follows:–

Male

Head.–Parafrontals golden-brown-pollinose, narrower (0.03 increasing to 0.10 mm.).

Thorax.–Dark brown, nonvittate. Accessory setulae shorter. Squamae medium yellow to brownish-yellow.

Abdomen.–Grevish-brown-pollinose, never with yellowish integumental color basad, the median vitta obscured.

Legs.–F_2 avs. even finer, pvs. equal to femoral width on basal two-thirds, then rapidly decreasing to apex. T_3 with a full row of ads. with two strong medially.

Hypopygium.–Not significantly different from that of *canicularis*.

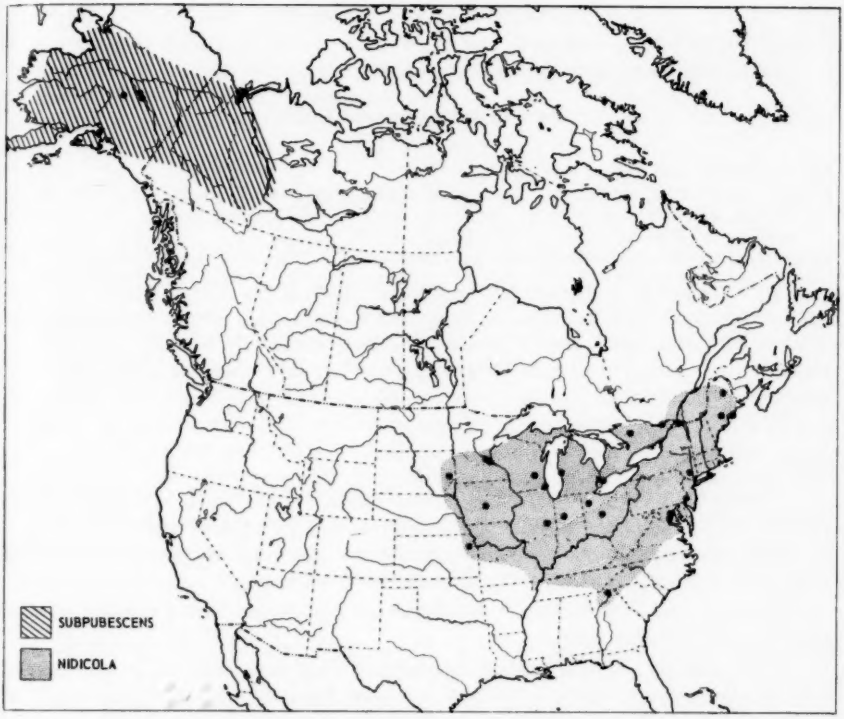
Female

Head.–Parafrontal setulae more irregular, more numerous. Parafacials more numerous. Third antennal segment broader (0.24 by 0.42 mm.).

Thorax.–Dark, at most vaguely trivittate. Mesopleurals somewhat more numerous.

Abdomen.–Completely dark, no trace of yellow basad.

Legs.–F_1 pvs. strong on apical half. F_2 avs. with usually two or three strong at one-third. F_3 frequently with three avs. strong. T_3 frequently with three avs. strong, ads. usually with more than six distinct.



Map 45. Geographic distributions of *F. subpubescens* Collin and *F. nidicola* Mall.

Type locality and type

Bell, Maryland. The type is not in the U.S.N.M., nor in Malloch's collection; it is almost certainly lost.

Most of the records for *nidicola* (see below) associate it with mammal and bird nests and with decaying or living animal matter, the latter rather doubtful.

Records, 46 ♂♂, 37 ♀♀ (Map 45)

MARYLAND. Bell, 2 ♂♂, 6 ♀♀ (ex nest of *Myiarchus crinitus*) (type series); Chevy Chase (ex *Amanita phalloides*), 1 ♀. MAINE. Sherman Sta. (*pars. Malacosoma disstria*), 1 ♂; Waltham (parasite ? *Malacosoma disstria*), 1 ♂; Augusta, ex squirrel nest (parasite *Epizeuxis*), 2 ♂♂; Bar Harbor (ex swallow nest), 1 ♂, 2 ♀♀. NEW YORK. Sta. Study Insects, Tuxedo, 1 ♂; Greenport, Long Island (from deer-mouse nest in hollow tree), 3 ♂♂, 1 ♀. NEW JERSEY. Riverton, 1 ♂. ONTARIO. Chatham, 1 ♂; Algonquin Park (from nest of kingfisher), 1 ♂; Algonquin Park (from nest of arctic three-toed woodpecker), 4 ♀♀; Ottawa, 1 ♀. QUEBEC. Hemmingford, 1 ♂. OHIO. Columbus, 1 ♂; Paulding Co., 1 ♂. INDIANA. Lafayette, 1 ♂. ILLINOIS. Urbana, 2 ♂♂. KANSAS. Lawrence, 1 ♀. IOWA. Ames (reared from *Phyllophaga*), 11 ♂♂, 6 ♀♀; Ames, Bishopp No. 9003, 1 ♂. SOUTH DAKOTA. Brookings, 2 ♂♂, 1 ♀. WISCONSIN. Dane Co., 5 ♂♂; Clint, 1 ♂; Razorback Lake, 1 ♂. MICHIGAN. Muskegon, 1 ♂. MINNESOTA. St. Paul (farm fly

trap), 3 ♂♂, 12 ♀♀; Hennepin Co., 1 ♀. GEORGIA. Mt. Enotah (4782 ft.), Towns-Union Co., 1 ♂, 1 ♀.

Collecting dates from April 27 to October 8.

Fannia subpubescens Collin

Figs. 131, 131A

Fannia subpubescens Collin, 1958, p. 89.

Fannia pubescens, of authors (nec Stein, 1908), Stein, 1916, p. 81; Kramer, 1917, p. 40; Séguy, 1923, p. 273; Ringdahl, 1934, p. 114; Collin, 1939, p. 140; Tiensuu, 1940, p. 156; Grensted, 1949, p. 99; Ringdahl, 1951, p. 166; Ringdahl, 1952, p. 158.

Fannia canicularis var. ? Hennig, 1955, p. 35, Fig. 8.

This species is even closer to *canicularis* than is the Nearctic *nidicola*, and can be separated from both by the long accessory thoracic setulae and incomplete hind-tibial anterodorsal row (usually only five erect). It has the silvery parafrontals and bare parafacials of *canicularis*, but the thoracic and abdominal coloration of *nidicola*.

It differs from *canicularis* as follows:

Male

Head.—Parafrontals narrow (0.03 increasing to 0.10 mm.), faintly brownish dorsad. Third antennal segment rather short (0.17 by 0.35 mm.).

Thorax.—Deep brownish-black, nonvittate. Acr. and accessory setulae long and fine. Pra. two or three subequal setulose bristles.

Abdomen.—1.5 by 3.0 mm. Brownish-grey-pollinose with a distinct narrow parallel-sided median vitta.

Legs.—Black. T_2 mat one-third as long as tibial diameter. F_3 pvs. erect and two-thirds as long as femoral diameter on basal half, reduced to prostrate setulae on apical third. T_3 avs. one or two; ads. five, one medial bristle strong.

Hypopygium.—Not significantly distinct from that of *canicularis*.

Female

Head.—Parafrontal setulae more irregular, parafacial setulae numerous. Third antennal segment short and broad (0.22 by 0.35 mm.).

Thorax.—Dark, at most weakly trivittate.

Abdomen.—Completely dark without trace of yellow basad; subshining, the pollen weak, no vitta present.

Legs.—F_1 pvs. strong on apical two-thirds. F_2 avs. with three or four strong on basal half. F_3 with usually two strong preapical avs. T_3 with usually two avs., ads. usually with more than six distinct.

Type locality and type

Since Collin omitted to designate a holotype, the syntype series includes all his Newmarket, June, 1957, specimens; and may technically include also Hennig's figures and specimens, and Stein's European specimens. A lectotype should be selected from the Newmarket series; and the type locality designated as Newmarket, England.

Remarks

The species is known in Europe from England, Sweden, Finland, France, and Germany; and in this country from Alaska and adjacent areas.

Collin, 1958 has noted that *subpubescens*, unlike *canicularis*, hovers "in a scattered manner in the open sunshine". . . .

Records, 3 ♂♂, 5 ♀♀ (Map 45)

ALASKA. Ladd A.F.B., 1 ♂, 1 ♀; Lower Tonsina, 1 ♂; Anchorage, 1 ♀; Fairbanks, 1 ♀; Minchumina, 1 ♀. NORTHWEST TERRITORIES. Aklavik, 1 ♂; Reindeer Depot, Mackenzie Delta, 1 ♀.

Collecting dates from May 19 to July 20.

I have also examined 1 ♂ from Äre, Sweden.

Fannia difficilis (Stein)

Figs. 132, 132A-B, 205

Homalomyia difficilis Stein, 1895, p. 58; Pandellé, 1899, p. 190; Wingate, 1906, p. 280.

Fannia difficilis, Stein, 1907a, p. 658; Strobl, 1909, p. 240; Schnabl, 1911, p. 89; Malloch, 1912a, p. 175; Ringdahl, 1912, p. 212; Stein, 1913a, p. 26; Stein, 1916, p. 81; Kramer, 1916, p. 40; Séguy, 1923, p. 270; Karl, 1928, p. 53; Ringdahl, 1934a, p. 114; Tiensuu, 1935, p. 45; Karl, 1937, p. 128; Aczél, 1938, p. 172; Collin, 1939, p. 139; Aczél, 1940, p. 33; Dodge, 1951, p. 341; Ringdahl, 1952, p. 156; Hennig, 1955, p. 41, Fig. 10.

This species is very close to *canicularis* in general appearance, but is most closely related to *variabilis* and *morrisoni,* less closely to *tibialis* and *alaskensis.* It is related to these and separated from *canicularis* by the long fine posteroventral hairs on the hind femur, and the single hind-tibial anterodorsal. From *canicularis, alaskensis,* and *morrisoni* it can be recognized by the haired propleura; from *variabilis* by the bare parafacials and broadly yellowed abdomen. The female of *difficilis* is recognized by the haired propleura and the strongly marked, subshining abdomen. Length 5.0-7.0 mm.

Male

Head.—Frontal bristles eight to 10, with a few interstitials. Parafrontals silvery, narrow (0.04 increasing to 0.09 mm.), separated by a narrow (0.03 mm.) frontal vitta. Parafacial setulae absent. Third antennal segment rather small, slender (0.16 by 0.38 mm.). Arista distinctly pubescent, basally sometimes yellowish.

Thorax.—Nonvittate, dark-brown-pollinose. Acr. bristles triserial presuturally, irregularly quadriserial postsuturally. Pra. two short, the anterior one distinctly stronger. Propleuron with several setulae medially (rarely only one or two). Stigmatal setulae none or one. Squamae whitish, margin yellowed. Wing clear.

Abdomen.—As described for *canicularis.*

Legs.—Completely black, or with knees yellowish. F_2 pvs. distinctly duplicated ventrad as one or two even rows of slightly hooked setulae. T_2 ventral mat very dense, two-thirds as long as tibial diameter. F_3 pvs. and ventrals erect but short, one-half as long as femoral diameter. T_3 avs. and ads. reduced to single strong bristles (no erect setulae basad).

Hypopygium.—Numerous long fine bristles at base of surstylus. Surstylus with inner process long and slender; outer process directed ventrally, rectangular in outline, bearing numerous setulae.

Female

Head.—Parafrontal setulae uniserial. Parafacial setulae weak and sparse, frequently indistinct. Third antennal segment elongate (0.20 by 0.45 mm.).

Thorax.—Dark brown, vittae absent or very faint. Acr. largely triserial, quadriserial only on posterior fourth. Propleural setulae one to four.

Abdomen.—Yellow basal color sometimes extending to lateral margins of fourth segment. Pollen faint, outlines of color pattern not obscured as in *cani-*

cularis but showing sharp contrast, the terminal portion of the abdomen subshining greyish-black.

Legs.—Black, at most the knees yellowed. F_2 with no strong avs.; basal pv. strong. T_3 with one av., one ad.

Type locality and type

Rekawinkl near Vienna, Austria. Type in Zoologisches Museum, Berlin.

Remarks

This species has been reared from mushrooms (Stein, 1895; Ringdahl, 1912). It is known in Europe from South Finland and Scotland, south to Spain, Corsica, and Hungary. In this country it is known from Georgia north to Massachusetts and west to Colorado.

Records, 41 ♂♂, 68 ♀♀ (Map 46)

GEORGIA. Rabun Bald and Co. (trap 4714), 4 ♂♂, 13 ♀♀; Mt. Enotah, Towns-Union Co., 3 ♂♂, 22 ♀♀; Stone Mt., Dekalb Co., 3 ♂♂, 1 ♀; Dekalb Co., 7 ♀♀; Kennesaw Mt., Cobb Co., 18 ♂♂, 5 ♀♀; Brasstown Bald, 1 ♀. TENNESSEE. Morgan Creek, 1 ♀. NORTH CAROLINA. Highlands (3800 ft.), 1 ♂. MARYLAND. Baltimore, 1 ♂, 3 ♀♀. NEW YORK. Raquette Lake, 1 ♂; Allegany State Park, 1 ♀; Tuxedo (Sta. Study Insects), 1 ♀; Ithaca, 1 ♀. CONNECTICUT. Canaan, 1 ♀. MASSACHUSETTS. Martha's Vineyard I., 2 ♂♂, 2 ♀♀; Wellfleet, 1 ♀; Sharon, 2 ♀♀. ONTARIO. Maynooth, 1 ♂. MICHIGAN. Muskegon Co., 1 ♀. MINNESOTA. Itasca Park, 6 ♂♂, 16 ♀♀. COLORADO. Eldora, 1 ♂.

Collecting dates from May 31 to October 19.

Fannia variabilis, new species

Figs. 133, 133A-C

This species is very close to *difficilis*, and shares with that species the characteristic haired propleura. From *difficilis* it can be recognized by the several parafacial setulae, brownish squamae, and dark brownish- to bluish-grey-pollinose abdomen with at most the second and third segments yellowish.

It differs from *difficilis* as follows:

Male

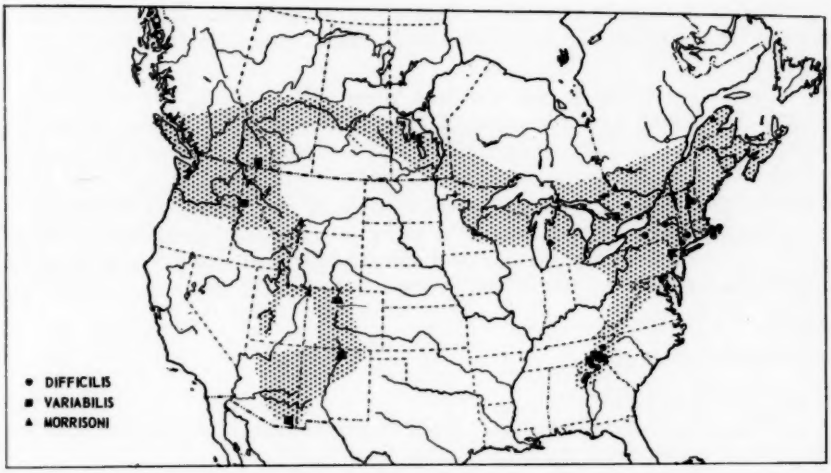
Head.—Frontal bristles usually 12 to 14 (eight in Orillia specimen) with several interstitials. Parafrontals usually brownish pollinose on dorsal half. Parafacials with several (three to eight) setulae just below the antennal base. Third antennal segment long and slender (0.20 by 0.46 mm.). Arista black, weakly pubescent.

Thorax.—Stigmatal setulae two to six. Squamae usually brownish, margins darker.

Abdomen.—Variable from entirely dark to with second and third segments basally yellow. Pollen dark brown to brownish-grey, the median vitta vague and linear in outline.

Legs.—F_2 avs. and pvs. stronger. F_3 with basal avs., ventrals, and pvs. long and hairlike, usually as long as femoral diameter. T_3 with one or two avs., one ad.

Hypopygium.—Surstylus with inner process long, expanded medially; outer process directed ventrally, slender, projecting at an acute angle to inner process; both processes with long setulae.



Map 46. Geographic distribution of *F. difficilis* complex.

Female

Not known.

Type

Holotype.—♂, Gold Hill, Latah Co., Idaho, 27.VII.1927 (J. M. Aldrich) (U.S.N.M. No. 64285).

Paratypes.—5 ♂ ♂, as follows: BRITISH COLUMBIA. 1 ♂, Robson, 19.VII.1947 (H. R. Foxlee). ARIZONA. 1 ♂, Cave Creek Canyon, Chiricahua Mts. (5500 ft.). NEW JERSEY. 1 ♂, Delaware West Gap, 13.VII.1913 (C. W. Johnson Collection). ONTARIO. 1 ♂, Orillia, 20.VII.1938 (C. H. Curran). GEORGIA. 1 ♂, Rabun Co., 2.VIII.1952, trap 4714 (H. Dodge) (Map 46).

Fannia morrisoni Malloch

Figs. 134, 134A-B

Fannia morrisoni Malloch, 1913a, p. 627; Malloch, 1924a, p. 420.
Fannia plebeia Malloch, 1918, p. 293, new synonymy.

This species is obviously closely related to *difficilis* and *variabilis*, but also resembles *nidicola* and *subpubescens*. From the first two it can be recognized by the bare propleura and completely dark abdomen, and from the latter two by the strong prealars and long setulose hind-femoral posteroventrals. It differs from *difficilis* as follows:

Male

Head.—Frontal bristles 10 to 13, with few interstitials. Parafrontals brownish dorsally, silvery ventrally, narrow (0.03 increasing to 0.09 mm.), separated by a distinct (0.04 mm.) black frontal vitta. Parafacial setulae variable from none to several. Third antennal segment twice as long as broad. Arista subpubescent.

Thorax.—Dark brown, nonvittate. Acr. triserial presuturally, the median row irregular postsuturally. Accessory setulae long and fine. Pra. two, subequal or posterior one slightly weaker. Propleuron bare. Stigmatal setulae absent. Squamae pale to dark brown, margins darker.

Abdomen.—1.6 by 3.0 mm. Greyish-brown-pollinose, the median vitta distinct or obscured, variable from almost linear (holotype) to distinctly triangulated.

Legs.—Entirely black, not even the knees yellowish. F_2 pvs. with strong regular duplicating row ventrally. T_2 mat half as long as tibial diameter. F_3 with three to five strong preapicals; pvs. and ventrals fine hairlike bristles about one-third as long as femoral diameter. T_3 with one to three avs. (two and three on holotype), one ad. strong with several erect setulae above and below.

Hypopygium.—Surstylus with the inner process short, parallel-sided; outer process ventrolateral in position, broad and strongly flattened, forming an acute angle with the inner process in lateral view.

Female

Not known.

Type locality and type

White Mts., New Hampshire. Type of *morrisoni* in U.S. National Museum, No. 15426, examined by me March, 1957.

Type locality of *plebeia*: Beulah, New Mexico. Type in Academy of Natural Sciences of Philadelphia, No. 6208; examined by me March, 1957.

Records, 9 ♂♂ (including types) (Map 46)

NEW HAMPSHIRE. White Mts., 1 ♂ (holotype of *morrisoni*); Bretton Woods, 1 ♂; Franconia, 1 ♂. QUEBEC. Laniel, 1 ♂; Mt. Albert, 1 ♂. MONTANA. Gallatin Mts., 1 ♂. COLORADO. Eldora, 1 ♂. NEW MEXICO. Jemez Spring, 1 ♂; Beulah, 1 ♂ (holotype of *plebeia*).

Collecting dates from June 29 to July 28.

Fannia alaskensis, new species

Figs. 135, 135A

This species is distinctly related to the *difficilis* complex and to the European *speciosa* Villeneuve. The combination of bare propleura, broad parafrontals, and basally yellowed abdomen serve to distinguish it from the *difficilis* complex, while the broad frontal vitta, dark and weakly vittate thorax, and largely dark pollinose abdomen distinguish it from *speciosa*. Length 6.5 mm.

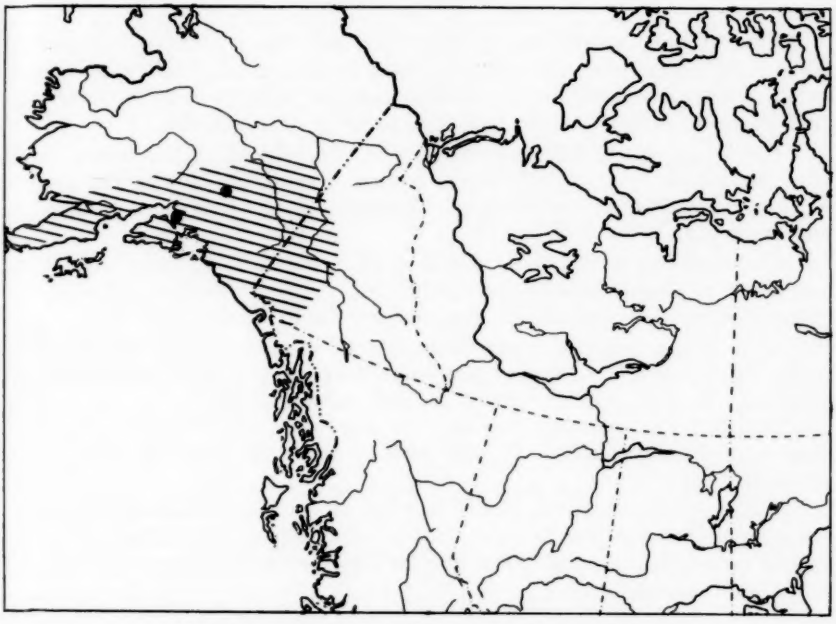
Male

Head.—Frontals about 12, rather strong with no interstitials. Parafrontals silvery, broad (0.07 increasing to 0.20 mm.), separated by a frontal vitta 0.13 mm. broad. Parafacial setulae absent. Third antennal segment broad (0.22 by 0.40 mm.). Arista subpubescent.

Thorax.—Dark-grey-pollinose with vague greyish-brown vittae as in *canicularis*. Acr. bristles triserial presuturally, irregularly quadriserial postsuturally. Pra. represented by one or two irregularly placed setulae. Propleuron bare. Stigmatal setulae absent. Squamae whitish, margins yellow. Wing clear.

Abdomen.—2.0 by 3.5 mm. Dark bluish-grey-pollinose, the median vitta broad, dark, with subparallel sides, integument of second and third segments yellow.

Legs.—Black, or with knees faintly yellowish. F_2 pvs. distinctly doubled or trebled ventrally. T_2 mat half as long as tibial diameter. F_3 ventrals and pvs. moderate in length (one-half to three-fourths femoral diameter), longest at four-fifths of femur.



Map 47. Geographic distribution of *F. alaskensis* Chill.

Hypopygium.–Bristles at base of surstylus moderate in length and number. Surstylus with inner process long, distinctly expanded subbasally; outer process broad, flat, projecting at right angles to the inner process, and bearing several scattered setulae.

Types

Holotype.– ♂, Healy, Alaska, 23.VI.1921 (J. M. Aldrich) (U.S.N.M. No. 64286).

Paratype.– ♂, Anchorage, Alaska, 2.VII.1951 (R. S. Bigelow) (C.N.C.) (Map 47).

Remarks

It is possible that this form is an extreme northern type of *speciosa*, as most of the differences are such as are known to occur in north-south clines within a species. The European species has contiguous parafrontals and much paler coloration (grey vittate thorax and almost entirely yellow abdomen), whereas the Alaskan species has broadly separated parafrontals and very dark coloration. However, the contrast in these characters is so extreme that I have little hesitation in describing the Alaskan form as a new species.

***Fannia tibialis* Malloch**

Figs. 136, 136A, 208

Fannia tibialis Malloch, 1913a, p. 461; Malloch, 1924a, p. 418.

This species is closely related to *pallidiventris*, but the abdomen is evenly brownish-grey-pollinose with a linear vitta. It can be recognized from all others of the subgroup by the broad frontal vitta in the male. Length 5.0-7.0 mm.

Male

Head.—Frontal bristles five to eight, short and strong. Parafrontals silvery, broad (0.08 increasing to 0.18 mm.), separated by a broad (0.15-0.20 mm.) frontal vitta. Parafacial setulae absent. Second antennal segment reddish, third segment short and stubby (0.22 by 0.38 mm.). Arista subpubescent.

Thorax.—Grey- to light-brownish-grey-pollinose with darker-brown vittae as in *canicularis*. Acr. bristles short, triserial presuturally, irregularly quadriserial postsuturally. Pra. one, strong. Squamae white. Wing veins yellowish, membrane clear.

Abdomen.—1.5 by 3.5 mm., widest at base of second segment, and evenly narrowing to apex. Wholly greyish-brown- to yellow-brown-pollinose, not yellowish basad, the vitta largely obscured and linear in outline.

Legs.—Coxae and tarsi dark, tibiae reddish-yellow, femora variable from largely infuscated to concolorous with tibiae, fore femur with at most apical half yellowed. F_2 pvs. doubled basally, trebled on median third. T_2 mat half as long as tibial diameter. F_3 ventrals and pvs. weak, about equal to femoral diameter, longest medially. T_3 with two or three avs., one (to three) ads. (three on type).

Hypopygium.—Bristles at base of surstylus mostly short, moderate in number. Surstylus with inner process short, parallel-sided and apically truncated; outer process broad, flat, inconspicuous, at right angles to inner process, and bearing several short slender setulae.

Female

Head.—Frontal vitta very broad, twice as wide as either parafrontal. Parafrontal setulae rather irregular. Parafacial setulae uniserial. Third antennal segment half as broad as long.

Thorax.—Vittae diffuse, sometimes quite indistinct. Otherwise as in the male.

Abdomen.—Evenly brownish-grey-pollinose, nonvittate.

Legs.—T_1 with no median ad. F_2 avs. and pvs. strong (two-thirds femoral diameter) on basal half. T_3 with two (or three) avs., one ad.

Type locality and type

Kaslo, British Columbia. Type in U.S. National Museum, No. 15216, examined by me April, 1957.

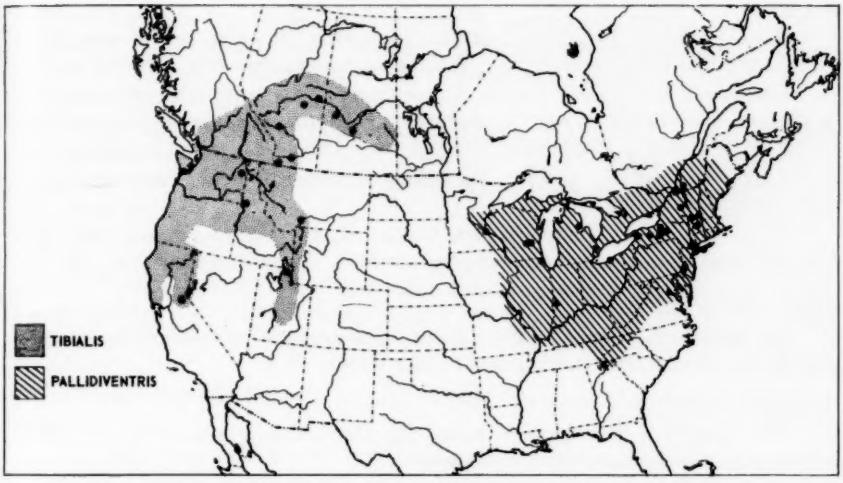
Remarks

This species ranges from Alberta and Saskatchewan south to Utah and California. There are no biological data.

Records, 21 ♂♂, 9 ♀♀ (Map 48)

BRITISH COLUMBIA. Kaslo, 2 ♂♂ (type series); Cranbrook, 1 ♂; Hector, 1 ♂. ALBERTA. St. Paul, 1 ♂; Waterton, 2 ♀♀; Lethbridge, 1 ♂; Calgary, 8 ♂♂, 1 ♀; Wataskiwin, 1 ♀. SASKATCHEWAN. Saskatoon, 2 ♂♂, 1 ♀; Atton's Lake, Cut Knife, 1 ♂. WASHINGTON. Deer Park, 1 ♂; Hoquiam, 1 ♀. IDAHO. Cedar Mt., Moscow, 1 ♂. MONTANA. Bozeman, 1 ♂; Bozeman (Mont. Expt. Sta.), 1 ♀. OREGON. Anthony Lake, 1 ♂. UTAH. Garden City, 1 ♀. CALIFORNIA. Tuolumne Meadows (8600 ft.), 1 ♀.

Collecting dates from April 30 to August 15, with the majority in May and June.



Map 48. Geographic distributions of *F. tibialis* Mall. and *F. pallidiventris* Mall.

Fannia pallidiventris Malloch

Figs. 137, 137A, 207

Fannia pallidiventris Malloch, 1924a, p. 422.

This species is strikingly distinguished from its relatives by the presence of several hind-tibial anteroventral bristles, and by the largely yellowish abdomen. Its closest relative is *tibialis*, which lacks the above characters. Length 5.0-7.0 mm.

Male

Head.—Frontal bristles five to eight, short and strong. Parafrontals silvery-pollinose, broad (0.06 increasing to 0.15 mm.) separated by a distinct (0.10-0.15 mm.) black frontal vitta. Parafacial setulae absent. Second antennal segment reddish, third segment black and twice as long as broad. Arista reddish, subpubescent.

Thorax.—Brownish-grey-pollinose with darker-brown vittae as in *canicularis*. Otherwise as described for *tibialis*.

Abdomen.—1.9 by 3.5 mm., elongate on posterior segments. Rather variable in color, with the second segment usually largely yellow, and the third and fourth occasionally so; pollen where evident (scarcely distinct on areas of yellow integument) variable from a blue-grey through a greenish-grey to a greyish-brown. Median vitta parallel-sided, usually deep yellow anteriorly changing to black on the posterior segments.

Legs.—Trochanters, femora, and tibiae yellow; coxae, tarsi, and often the dorsal portions of fore femora darkened. F_2 pvs. weakly doubled throughout. T_2 ventral mat half as long as tibial diameter. F_3 ventrals and pvs. usually distinctly longer than femoral diameter, longest preapically. T_3 with four to six avs., one ad.

Hypopygium.—Almost identical to that of *tibialis*, but bristles at base of surstylus stronger, and outer process of surstylus somewhat projecting.

Female

Head.—Normal, parafrontal setulae somewhat irregular below the lower orbital, parafacial setulae uniserial. Third antennal segment half as broad as long.

Thorax.—Vittae golden-brown, not strongly contrasting with ground color of thorax. Acr. bristles triserial presuturally, becoming quadriserial postsuturally, sometimes irregularly quadriserial throughout. Otherwise as in the male.

Abdomen.—Entirely yellow, the pollen whitish and faint, becoming somewhat olivaceous basally.

Legs.—Yellow with only the tarsi black. F_2 avs. evenly setulose; pvs. with a strong basal bristle, remainder uniserial, setulose. T_3 with one av., one ad.

Type locality and type

Mt. Greylock, Massachusetts. Type in Museum of Comparative Zoology, Cambridge, Massachusetts, examined by me March, 1959.

Remarks

This species is known from Massachusetts to Georgia and west as far as Minnesota. There are no biological data.

Records, 15 ♂♂, 4 ♀♀ (Map 48)

MASSACHUSETTS. Mt. Greylock, 1 ♂ (holotype). VERMONT. Mt. Ascutney, 1 ♂ (paratype). QUEBEC. Hemmingford, 1 ♂; Abbotsford, 1 ♂. ONTARIO. Niagara Glen, 1 ♂. NEW YORK. Mt. Marcy (Heart Lake, 2150 ft.), 1 ♂; Slaterville (Wild Flower Preserve), 1 ♂. PENNSYLVANIA. Pt. Pleasant, 1 ♂; Castle Rock, Delaware Co., 1 ♀. OHIO. Mentor, 1 ♂. MICHIGAN. Arenac Co., 1 ♂. INDIANA. Terre Haute, 1 ♂. ILLINOIS. Grayslake, 1 ♀; no locality, 1 ♂. MINNESOTA. St. Paul (fly trap), 1 ♀. WISCONSIN. Madison, 1 ♀; Dane Co., 2 ♂♂. GEORGIA. Rabun Co., 1 ♂.

Collecting dates from May 13 to September 3, with the majority in July.

Fannia ceringogaster, new species

Figs. 138, 138A, 206

This species belongs to the *difficilis* complex and is most closely related to the Palaearctic *vespertilionis* Ringdahl, less closely to the Nearctic *alaskensis*. It can be distinguished from all related forms by the completely yellow abdomen. *F. binotata* is superficially similar but has bristled parafacials and strikingly different male genitalia. Length 6.0-7.0 mm.

Male

Head.—Frontal bristles six or seven, short and strong. Parafrontals silvery-pollinose, rather broad (0.06 increasing to 0.20 mm.), separated by a linear frontal vitta. Parafacial setulae absent. Second antennal segment apically reddish, third long and slender (0.16 by 0.50 mm.), yellow on basal half. Arista pubescent.

Thorax.—Dark brownish-grey, faintly vittate. Acr. bristles irregularly triserial. Pra. represented by one to three irregularly placed setulae. No propleural or stigmatal setulae. Squamae whitish, margin yellowed. Wing clear.

Abdomen.—2.0 by 3.5 mm. Yellow, weakly white-pollinose, median vitta dark yellow, basal segment dark.

Legs.—Black, only knees and trochanters yellow. F_2 pvs. two-thirds femoral diameter, the row doubled or trebled on the ventral surface. T_2 strongly

thickened apically (to twice basal diameter); ventral mat half as long as tibial diameter. F_3 pvs. and ventrals with numerous fine erect setulae one-third as long as femoral diameter, pv. row somewhat stronger preapically. T_3 with two or three avs., two to four ads.

Hypopygium.—Several short stubby bristles at base of surstylus. Inner process of surstylus long and slender (over twice basal width of surstylus); outer process rather narrow, flattened, not projecting, with several scattered setulae on ventral surface.

Female

Head.—Parafrontal setulae uniserial. Parafacial setulae sparse, weak. Parafacials lacking the distinct antennal spot of the other species of the group. Palpus, unlike that of other species of the group, distinctly broadened and spatulate.

Thorax.—Greyish-brown, weakly vittate. Otherwise as described for the male.

Abdomen.—As described for the male, except without the vitta.

Legs.—Dark brownish-black, knees yellowish. F_2 avs. and pvs. setulose, none stronger. T_3 with two avs., one strong and one to four weak ads., and occasionally an anterior bristle medially.

Remarks

This species is very close to the European *vespertilionis*, but that species, according to the description, has the frons somewhat wider than the third antennal segment, two pra. bristles, and legs largely yellow with only the tip of F_3 darker. On the basis of these differences and the eastern distribution of the Nearctic form I have described this form as new.

Type

Holotype.— ♂, Norway Bay, Quebec, 9.IX.1946 (G. E. Shewell) (C.N.C. No. 6684).

Allotype.— ♀, Laniel, Quebec, 7.VIII.1939 (F. P. Ide) (C.N.C.).

Paratypes.—1 ♀, West River, Nova Scotia, 24.VII.1912 (R. Matheson); 1 ♀, Bar Harbor, Maine, 18.VIII.1920 (C. W. Johnson). (Map 49).

Fannia binotata, new species

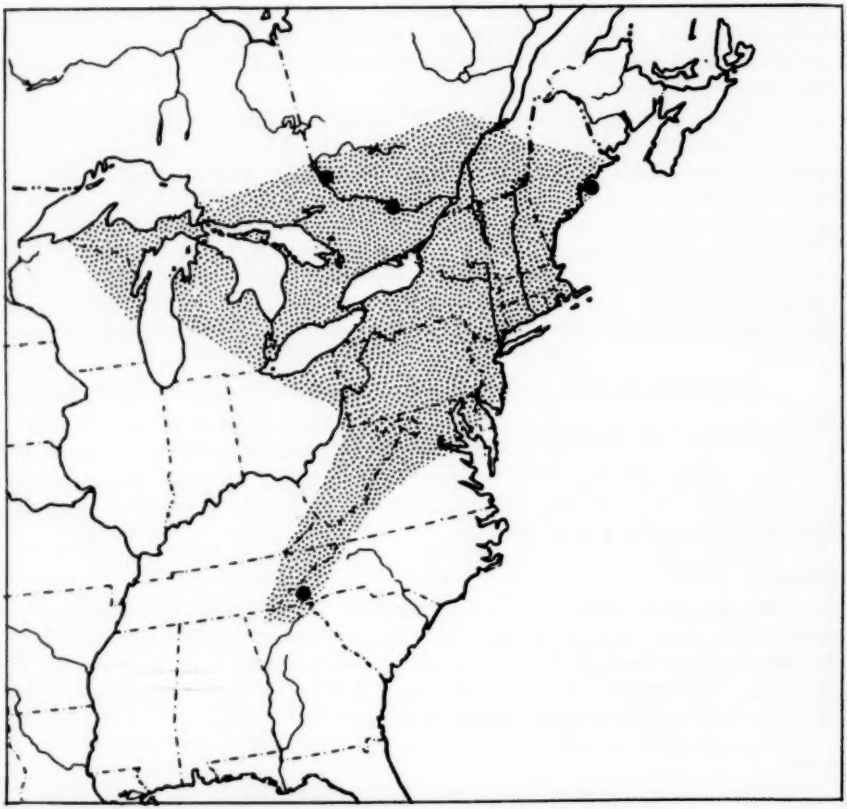
Figs. 139, 139A-B

This species bears a close superficial resemblance to *ceringogaster*, but the single row of hind-femoral posteroventrals, the strongly setulose parafacials, and aberrant male genitalic structure are distinctive characteristics. Length 6 mm.

Male

Head.—Frontal bristles 12 to 14, irregular, longest medially. Parafrontals brownish-grey dorsally, silvery near the antennae, rather narrow (0.06 increasing to 0.14 mm.), separated by a distinct (0.15 mm.) black frontal vitta. Parafacials unusually broad, with several strong setulae extending to the tip of third antennal segment. Third antennal segment short and stubby (0.24 by 0.30 mm.). Arista pubescent.

Thorax.—Dark greyish-brown, nonvittate. Acr. bristles broadly biserial presuturally, quadriserial postsuturally. Pra. as one strong and one weaker



Map 49. Geographic distribution of *F. ceringogaster* Chill.

bristle. No propleural, two or three stigmatal setulae. Squamae equal, pale yellow, margins darker. Wing membrane rather infuscated, veins dark brown.

Abdomen.—1.8 by 2.9 mm. Almost wholly yellowish-orange, only basal segment infuscated. Median vitta linear and weak, dark brown, fading out on fourth segment.

Legs.—Femora and tarsi dark reddish-brown to black, knees and tibiae reddish-yellow. F_2 pvs. curled and as long as femoral diameter basad, decreasing evenly apicad, doubled on basal two-thirds. T_2 normal in shape, ventral mat half tibial diameter. F_3 pvs. in a full row decreasing from bristles as long as two-thirds femoral diameter basally to setulae apically, ventrals setulose. T_3 with one av., one ad.

Hypopygium.—Evenly setulose, with no distinct clump of bristles at base of surstylus. Surstylus strikingly different from other members of the subgroup, with the main process arising medially and curving inwards; no distinct latero-ventral process. Ninth sternum less strikingly broadened with postgonites long and slender.

Female

Not known.

Type

Holotype.– ♂, Atlacomulco, Mexico, Mexico (8800 ft.), 18.VIII.1954 (University of Kansas Mexican Expedition) (Snow Entomological Museum).

Paratypes.– ♂, Hood River, Oregon.

glaucescens subgroup

This subgroup is rather heterogeneous, the three included species being aberrant and only loosely related to each other. It is indicated that they may have diverged from the main *canicularis* group soon after the split-off of *Euryomma*, *Piezura*, and *Platycoenosia*.

Male

Head.–Frontal bristles six to nine, often only four or five strong. Upper orbital bristle present. Parafrontals variable in width, silvery, separated by a distinct frontal vitta one to two times parafrontal width. Parafacial setulae absent. Occipital bristles short and regular. Postoccipital bristles absent. Antenna black, bristle on second segment short or absent, third segment variable in proportions. Arista at most faintly pubescent. Palpus long, faintly spatulate, spinose; theca pollinose, not expanded, weakly sclerotized.

Thorax.–Variable in color and vittation. Acr. bristles evenly triserial or somewhat quadriserial on posterior fourth. Accessory setulae sparse and short. Two prealar bristles, the posterior one weaker. No propleural or stigmatal setulae. Mesopleurals sparse, dorsal row scarcely to distinctly stronger. Scutellum bare discally. Squamae subequal, lower distinctly projecting, whitish-yellow. Haltere yellow. Wing color pale yellowish to clear.

Abdomen.–Variable from three-fifths to three-fourths as broad as long. Pollinosity variable, integumental color dark. Median vitta parallel-sided. Composite pregenital segment broad (unique), incised medially to form a membranous pocket in *latifrons* and *glaucescens*. Hypopygium inconspicuous except in *glaucescens*, where it is strongly swollen.

Legs.–Color variable from entirely black to reddish with pale joints. Segments, especially the femora, short and broad. F_1 pvs. usually decreasing evenly to base, but in *laevis* of equal length to base, and doubled on basal half. T_1 without an anterodorsal bristle. C_2 normal. F_2 avs. variable, 10 to 14 on basal five-eighths, gradually decreasing to a comb of 10 to 12 short bristles; pvs. with the basal ventral present, strong to weak; weak bristles to one-half ventrally duplicated, then stronger to four-fifths and more irregular, somewhat clumped setulae to apex. T_2 variably developed, weakest in *latifrons*, strongest in *glaucescens*, at most increasing to twice basal diameter, one ad., one pd. C_3 with two posterior hairs. F_3 avs. with short erect or prostrate setulae, two or three preapically strong; pvs. with prostrate to erect setulae on basal two-thirds or three-quarters, apically bare. T_3 with one av., one ad., no pvs.

Hypopygium.–Variable, so that a general description is very difficult to organize. Whereas *glaucescens* shows affinities with the *canicularis* subgroup, *latifrons* has a genitalic structure very similar to that of *Euryomma* spp. and *laevis* is intermediate in some characters and aberrant in others. The bristling of the hypopygium proper is variable. The cercal plate is strongly fused and broadened apically, faintly lobate in *glaucescens*. In *glaucescens* and *laevis*, each surstylus has the main process at the inner margin with a ventrolateral process as in the *canicularis* subgroup, whereas in *latifrons* each surstylus is medially placed with a broad dorsal keel. The ninth sternum is fairly well developed in *laevis*, but

strongly reduced in *latifrons* and *glaucescens*. In *glaucescens* the aedeagus is surrounded by a heavily sclerotized tube, whereas in *laevis* and *latifrons* the aedeagus is free but well sclerotized. The postgonites form the heavy tube in *glaucescens* whereas they are small posterior flaps in *latifrons*, and are modified and fused into the sternum in *laevis*. The fifth sternum is broader than long with the bristles crowded posterolaterally in *laevis* and *latifrons*, whereas it is developed into a strongly sclerotized projecting triangular plate without bristles in *glaucescens*.

Female

Head.—Parafrontals distinctly pollinose, from one-third to one-fourth as broad as long, setulae uniserial or irregularly biserial. Parafacials with or without a distinct reflecting spot opposite the antennal base, and with a row of fine setulae (rarely weak or absent) on the dorsal half. Occipital bristles short and regular. Postoccipital bristles absent. Antenna and mouthparts as in the male.

Thorax.—As in the male, but setulae usually shorter and pollen more greyish.

Abdomen.—Unicolorous black, pollen variable from evenly grey with a faint indication of a brown median vitta (*laevis*) to scarcely evident with the abdomen subshining bluish-black (*glaucescens*).

Legs.—Much as in the male, but bristling generally weaker. F_2 avs. setulose with usually two or three stronger sub-basally; pvs. evenly setulose except for a distinct basal bristle. F_3 avs. setulose except for two or three strong preapical bristles; pvs. setulose.

Ovipositor.—Subanal plate broader than long, evenly setulose, or with the setulae somewhat crowded apically. Cerci short. Eighth tergum well developed laterally, reduced dorsally. Eighth sternum variable from a solid plate (*laevis*) to a pair of setose plates (*latifrons*) to absent (*glaucescens*). Seventh segment with the tergum reduced dorsally, the sternum broader than long, separated from (*laevis* and *latifrons*), or fused with (*glaucescens*), the tergum; bristles scattered on apical half. Sixth tergum and sternum separated, the sternum broader than long and bristled on apical half or more, the tergum containing the sixth spiracle, the seventh spiracle lying in the membrane just behind the tergum. Spermathecae two, mushroom-shaped with a short, straight duct base inserted medially on the indented base of the spermatheca.

Larva

Not known for any of the included species.

Fannia glaucescens (Zetterstedt)

Figs. 140, 140A-E, 216, 262

Aricia glaucescens Zetterstedt, 1845, p. 1586; Zetterstedt, 1860, p. 6253.

Homalomyia glaucescens, Stein, 1895, p. 112; Meade, 1897, p. 66; Pandellé, 1899, p. 191; Aldrich, 1905, p. 538; Wingate, 1906, p. 282.

Fannia glaucescens, Stein, 1907a, p. 659; Stein, 1907c, p. 17; Strobl, 1909, p. 240; Schnabl and Dziedzicki, 1911, p. 95, Figs. 367, 368, 839; Ringdahl, 1912, p. 214; Stein, 1913a, p. 26; Stein, 1916, p. 81; Stein, 1920, p. 44; Ringdahl, 1921, p. 40; Mercier, 1922, p. 5; Séguy, 1923, p. 270, Fig. 5; Malloch, 1924a, p. 417; Malloch, 1924b, p. 517; Ringdahl, 1928, p. 27; Karl, 1928, p. 58; Ringdahl, 1934a, p. 115; Tiensuu, 1935, p. 45; Karl, 1937, p. 115; Brauns, 1949, p. 160; Zangheri, 1950, p. 88; Ringdahl, 1952, p. 158; Ringdahl, 1954a, p. 74; Hennig, 1955, p. 44, Figs. 43, 99.

Aricia lucidula Zetterstedt, 1860, p. 6248; syn. *teste* Stein, 1895.

Homalomyia herniosa Rondani, 1866, p. 130; Rondani, 1877, p. 54; Meade, 1882, p. 204; syn. *teste* Stein, 1895.

This species is strikingly distinct from all others of the group in genitalic structure, but, although it is definitely aberrant, its closest relative is probably *laevis*. The greatly enlarged hypopygium and the heavily sclerotized and backwardly projecting triangular fifth sternum in the male, and the glossy appearance of both sexes permit easy recognition of this species. Length 4.0-5.0 mm.

Male

Head.—Parafrontals moderately broad (0.06 increasing to 0.12 mm.), separated by a broad (0.07 mm.) black frontal vitta. Second antennal segment with a strong bristle, third segment twice as long as broad.

Thorax.—Subshining brownish-black, nonvittate. Acr. bristles triserial presuturally, irregularly quadriserial postsuturally. Mesopleural bristles scarcely stronger dorsally.

Abdomen.—Short, somewhat truncated (1.5 by 2.1 mm.). Pollen scanty bluish-brown, abdomen subshining, so that the median vitta is often rather indistinct. Hypopygium strongly projecting, large and swollen.

Legs.—Black, not even knees yellow. F_2 avs. with six well-spaced on basal half, then four longer (three-fifths as long as femoral diameter) close-set, directed apicad, and a short comb of nine to 11 bristles; pvs. with a strong basal bristle, then a weak doubled row on basal half and a strong, more irregular, trebled row to four-fifths followed by a few preapical setulae. T_2 somewhat flattened on basal half, then rapidly increasing to twice basal diameter; ventral mat short and dense. F_3 avs. and pvs. prostrate on basal two-thirds.

Hypopygium.—See this section under subgroup description.

Female

Head.—Parafrontals rather weakly pollinose on upper half, brownish-tinged on inner margins, almost four times as long as broad, setulae uniserial. Parafacials with a weak reflecting spot; setulae often sparse and weak, rarely absent.

Thorax.—More greyish-pollinose than in the male with three vittae weakly distinguishable in certain lights.

Abdomen.—Sparsely pollinose, distinctly subshining.

Legs.—F_2 avs. setulose except for two erect stronger bristles at one-third.

Type locality and type

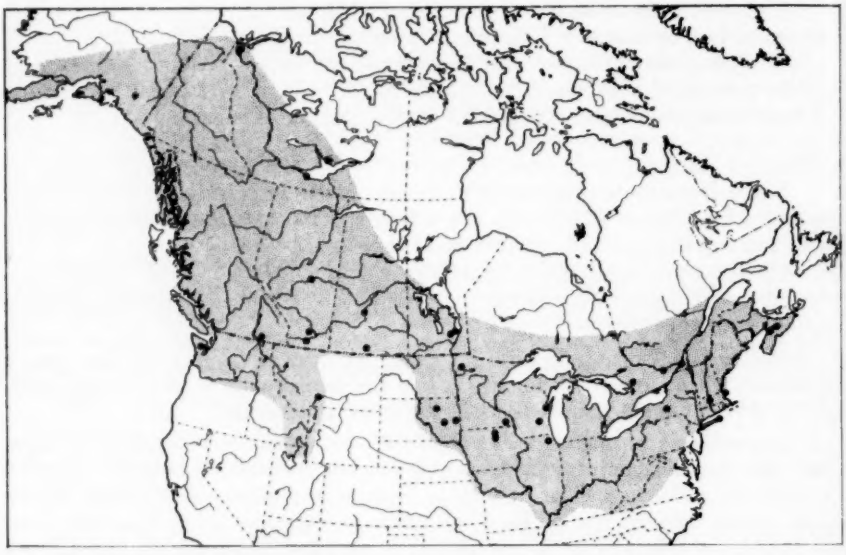
Lund, Sweden. Type in Zoologiska Institution, Lund, Sweden (reexamined by Stein, 1895, and Ringdahl, 1939).

Remarks

This species has been associated with reeds and strand vegetation (Ringdahl, 1934a). Specimens before me have been swept from peas, sugar beets, alfalfa blossoms, and clover. It is known in Europe from Scandinavia and England south to northern Italy and Hungary, and east to Tibet. In the Nearctic region it ranges from Alaska south to Washington and east through Illinois to Nova Scotia and New York.

Records, 65 ♂♂, 23 ♀♀ (Map 50)

ALASKA. Fitzgerald, 1 ♂. NORTHWEST TERRITORIES. Aklavik, 24 ♂♂, 3 ♀♀; Hay River, 3 ♂♂, 5 ♀♀; Yellowknife, 1 ♂. ALBERTA. Edmonton, 1 ♂; Chin, 5 ♂♂, 1 ♀; Lake Newel, 8 ♂♂, 1 ♀. WASHINGTON. Lake Cushman, 1 ♀. MONTANA. Bozeman (Mont. Expt. Sta.), 1 ♀. SASKATCHEWAN.



Map 50. Geographic distribution of *F. glaucescens* (Zett.).

Saskatoon, 1 ♂; Assiniboia, 1 ♀. MANITOBA. Gimli, 2 ♂♂, 1 ♀; Teulon, 1 ♂. SOUTH DAKOTA Erwin, 2 ♀♀; Aberdeen, 2 ♂♂; Brookings, 1 ♂. MINNESOTA. Marshall Co., 1 ♂; Olmstead Co., 1 ♀. WISCONSIN. Green Bay, 2 ♂♂, 1 ♀ (swept from clover and peas); Madison, 1 ♂. IOWA. Mason City, 1 ♂ (on sugar beet); Manly, 1 ♂. ILLINOIS. Algonquin, 1 ♂, 1 ♀. ONTARIO. Port Sydney, 1 ♀; Ottawa, 1 ♂. QUEBEC. Isle St. Paul, 2 ♂♂, 1 ♀. NOVA SCOTIA. Kentville, 1 ♂; Truro, 1 ♂. MASSACHUSETTS. Amherst, 1 ♀; Beverley, 2 ♂♂. NEW YORK. Ithaca, 1 ♂; Peconic, Long Island, 1 ♀.

I have also examined European material of both sexes from England and Germany, and one male from Orenburg, U.S.S.R.

Fannia laevis (Stein)

Figs. 141, 142, 142A, 214

Homalomyia laevis Stein, 1897, p. 147.
Fannia laevis, Malloch, 1918, p. 293; Malloch, 1924a, p. 420.

This is also an aberrant form on the basis of genitalic structure, but in external structure and chaetotaxy it shows its relationship to *latifrons* and *glaucescens*. It is distinctly greyish-pollinose, but lacks the broad frontal vitta of *latifrons*. Length 4.0-5.0 mm.

Male

Head.—Parafrontals moderately broad (0.06 increasing to 0.12 mm.), separated by a broad (0.06 mm.) black frontal vitta. Second antennal segment with a strong bristle, third segment distinctly longer than broad (0.16 by 0.42 mm.).

Thorax.—Brownish-grey-pollinose with three distinct medium-brown vittae. Acr. bristles broadly separated, triserial anteriorly, quadriserial on posterior third. Mesopleural bristles slightly stronger dorsally.

Abdomen.–Normal in proportions (1.6 by 2.5 mm.). Pollen thick, greyish, the median vitta distinct. Hypopygium rather inconspicuous.

Legs.–Black, the knees yellowish. F_2 avs. numerous, weakly differentiated, with about 14 on basal two-thirds, gradually decreasing to a weakly differentiated comb of about twelve; pvs. in a duplicated row on basal half, changing to a strong quadriserial cluster preapically. T_2 and F_2 as described for *glaucescens.*

Hypopygium.–Refer to this section under the subgroup description.

Female

Head.–Parafrontals evenly grey-pollinose, one-third as broad as long, setulae irregularly biserial. Parafacials usually with a distinct reflecting spot, setulae usually distinct, somewhat clumped.

Thorax.–As described for the male.

Abdomen.–Distinctly grey-pollinose, with a faint brownish median vitta.

Legs.–As described for *glaucescens.*

Type locality and type

Horse Neck Beach, Massachusetts. Type in the Zoologisches Museum, Berlin, Germany. One specimen of type series in Chicago Natural History Museum, Chicago, Illinois.

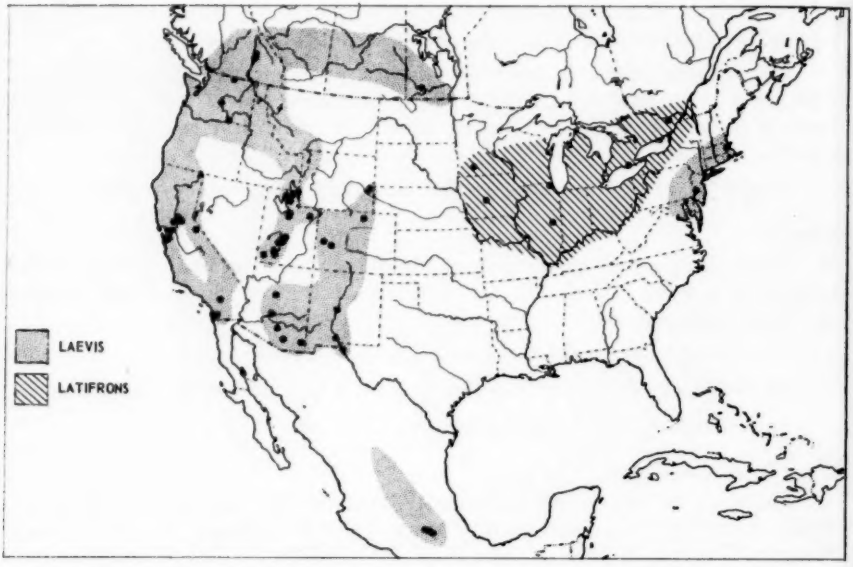
This species is common in the far-western states, but is also known from the east and from the southern limits of the Mexican Plateau.

It has been swept from celery, peas, beets, *Salsola pestifer,* and alfalfa, and has been collected at light and from a fly trap. It has also been collected in some numbers over mammalian carcasses.

Records, 72 ♂♂, 27 ♀♀, six other specimens (Map 51)

MASSACHUSETTS. Horseneck Beach, 1 ♂, 5 specimens in type series. PENNSYLVANIA. Spring Brook, 1 ♂. NEW YORK. Riverside, Long Island, 1 ♂. BRITISH COLUMBIA. Vernon, 3 ♂♂; Armstrong, 1 ♀. WASHINGTON. Kennewick, 1 ♀; O'Sullivan Dam, Grant Co., 2 ♂♂, 4 ♀♀; Oroville, 1 ♀. WYOMING. Lusk, 1 ♀. IDAHO. Burley, 1 ♂. NEVADA. Austin, 1 ♂. CALIFORNIA. Sacramento, 1 ♂, 1 ♀ (at light), 1 ♀; San Diego, 4 ♂♂; San Diego Co., 2 ♂♂; Davis, 5 ♂♂; Victorville, 1 ♂, 1 ♀; Milton, Calaveras Co., 1 ♀; Bacaville, Solano Co., 1 ♂; Mono Lake, 1 ♂; Stanford Univ., 1 ♂; Palo Alto, 1 specimen; Pleasanton, 2 ♂♂; Indio Area, Riverside Co., 1 ♂; Redwood City, San Mateo Co., 1 ♂. UTAH. Perry, 2 ♂♂; Sigurd, 4 ♂♂; Monroe (ex *Salsola pestifer*), 1 ♂; Midvale (on celery), 1 ♀; Salt Lake City, 2 ♂♂, 1 ♀, (on celery) 1 ♂; Corinne (on celery), 1 ♂, 1 ♀; St. George, 3 ♂♂, 3 ♀♀; Logan, 1 ♂, 2 ♀♀, (at light) 1 ♂; Kanab, 1 ♂; Mt. Carmel, Kane Co., 1 ♂; Taylor (on beets), 1 ♀; Cache Junction, 1 ♀; Richfield, 1 ♂; Vernal, 1 ♂; Ephriam (on peas), 1 ♀; Garland, 1 ♂; Kanesville, 1 ♂. COLORADO. Paonia, 3 ♀♀; Fort Collins, 3 ♂♂; Grand Junction, 1 ♂; no data, 1 ♂. ARIZONA. Rustler's Peak, Chiricahua Mts., 1 ♂; Eloy, Pinal Co., 1 ♂; Phoenix (ex fly trap), 1 ♂; Tucson, 2 ♂♂; Flagstaff, 1 ♂. NEW MEXICO. Socorro, 4 ♂♂; Las Cruces, 1 ♀. TEXAS. El Paso, 1 ♀. MEXICO. Mexico City, 1 ♂; District Federale, 1 ♂; Kochimilco, 1 ♂.

Collecting dates from March 3 to December 3 with the majority in the months from April to August.



Map 51. Geographic distributions of *F. laevis* (Stein) and *F. latifrons* Mall.

Fannia latifrons Malloch

Figs. 143, 143A-B, 215

Fannia latifrons Malloch, 1914, p. 240; Malloch, 1924a, p. 416.

This is an unusual species. The genitalic structure is similar to that of *Euryomma*, but the male lacks the lower orbital characteristic of that genus, although the male frontal vitta is broad, and the species has the small stocky habitus of *Euryomma*. However, in female genitalic structure, and in general appearance and coloration, this species is a typical *Fannia*. Length 3.5-4.0 mm.

Male

Head.—Parafrontals silvery, moderately broad (0.05 increasing to 0.09 mm.) separated by a broad (0.12 mm.), whitish-pollinose frontal vitta. Second antennal segment reddish, with no strong bristle; third segment distinctly broadened (0.07 by 0.31 mm.).

Thorax.—Greyish-brown-pollinose with brownish, weakly marked vittae. Acr. bristles evenly triserial. Mesopleural bristles sparse, with dorsal row distinctly stronger.

Abdomen.—Almost as broad as long (0.9 by 1.3 mm.), bluish-grey-pollinose, the median vitta distinct. Hypopygium rather inconspicuous.

Legs.—Reddish to dark brown, knees and all tarsi yellowish. F_2 avs. short, weakly differentiated, decreasing evenly to apex; pvs. short, doubled on the apical half only. T_2 evenly and weakly thickened to apex; ventral mat consisting of short and only suberect setulae. F_3 avs. and pvs. of erect setulae, increasing somewhat apically.

Hypopygium.—See discussion under this heading in the subgroup description.

Female

Head.—Parafrontals evenly grey-pollinose, one-third as broad as long, setulae uniserial. Parafacials with no reflecting spot, setulae often weak and sparse, rarely absent.

Thorax.—As described for the male.

Abdomen.—Weakly pollinose, dark and subshining.

Legs.—F_2 avs. evenly setulose, none stronger.

Type locality and type

Elliot, Illinois. Type in Illinois Natural History Survey Collection, Urbana, Illinois; examined by me in February, 1956.

Remarks

This species is known from only a few specimens from Iowa and Minnesota to eastern Ontario. The only biological data are that the species emerged into a black fly cage placed in the water at the edge of the river.

Records, 4 ♂♂, 3 ♀♀ (Map 51)

MINNESOTA. New Ulm, 1 ♂. IOWA. Ames, 1 ♂. ILLINOIS. Algonquin, 1 ♀; Elliot, 1 ♂ (holotype). ONTARIO. Simcoe, 1 ♀; Ottawa, 1 ♀; Ottawa River, Remic Rapids, Ottawa (emerged into cage), 1 ♂.

Collecting dates from May 13 to August 1.

pusio subgroup

This subgroup, in contrast to the other two sections of the *canicularis* group, is very homogeneous, with the specific characters restricted almost entirely to the male hind legs and the female parafrontals. In contrast to the condition in the other two subgroups, the upper orbital is absent and the abdomen is trimaculate in the males. However, general bristling and structure, including the genitalia, show the close relationship between this subgroup and the other two.

Male

Head.—Frontal bristles 10 to 13, strong and regular. Upper orbital bristle absent. Parafrontals silvery, linear (0.02 increasing to 0.08 mm.), contiguous. Parafacials with several setulae on the upper two-thirds. Occipital bristles short and regular. Postoccipital bristles absent. Second antennal segment with one strong bristle, third segment half as broad as long, arista subpubescent. Palpus linear, theca weakly sclerotized, pollinose.

Thorax.—Dark subshining brownish-black, nonvittate. Acr. bristles strong, evenly triserial. Accessory setulae sparse, short. Prealar bristles two or three, setulose, shorter posteriorly. Propleural and stigmatal setulae absent. Mesopleural bristles with the dorsal row scarcely stronger. Scutellum bare discally. Squamae normally pale yellow (dark brown in *leucosticta*); lower slightly larger, distinctly projecting. Haltere pale yellow (deep yellow in *leucosticta*). Wing veins dark brown, membrane clear.

Abdomen.—1.5 by 2.0 mm. Bluish-grey- to grey-pollinose on the apical three segments, with a parallel-sided median vitta and a pair of partially confluent posterolateral brown spots on the third and fourth segments. Second segment medially or entirely dark brown, fifth segment unicolorous or with faint lateral spots.

Legs.—Black, not even knees yellowish. F_1 pvs. evenly decreasing basally. T_1 without median bristles. F_2 avs. with five or six short and strong on basal half,

a break and a row of about 10 evenly decreasing in strength to form a preapical comb; pvs. with a strong basal bristle, then about seven short and weak on the basal two-thirds, and a clumped preapical comb of about 10 to 12. T_2 evenly but weakly increasing to apex with one ad., one posterior; ventral mat weak, as long as tibial diameter, almost uniserial. C_3 with two or three bristles. F_3 even or moderately swollen preapically; avs. variable from a full strong row to a single strong preapical with a median clump of setulae; pvs. usually with strong bristles on at least the apical half. T_3 with one to a full row of avs.; ads. in a full row with usually one stronger medially; no pv. setulae erect.

Hypopygium.—Evenly bristled with one strong bristle near base of each surstylus. Cercal plate simple, only weakly fused medially. Surstylus broadly joined to ninth tergum with only a weak lateral incision, with normally a short and roughly parallel-sided inner process and a more or less well-developed setulose ventrolateral process (ventrolateral process weak or absent in *pusio, howardi,* and *leucosticta*). Bacilliform process absent. Ninth sternum slender and straplike, with large and elongate postgonites and a membranous aedeagus surrounded by a heavily sclerotized process projecting dorsad outside cercal plate. Fifth sternum of primitive structure, longer than broad, with bristles scarcely differentiated and arranged in a median series.

Female

Head.—Parafrontals one-third as broad as long, variable from fully grey-pollinose to completely glossy, setulae uniserial, separated by a black frontal vitta as broad as either parafrontal. Otherwise as described for the male.

Thorax.—As described for the male.

Abdomen.—Normally evenly subshining black, but in *leucosticta* the abdomen bluish-brown-pollinose basally, the fourth and fifth segments bearing a median vitta and distinct lateral spots.

Legs.—As described for the male, except the hind femora normal in shape and bristling; avs. and pvs. setulose except for two or three strong preapical avs. T_3 with only one ad.

Ovipositor.—Subanal plate broader than long, setulose marginally, disc bare. Cerci short and stubby. Eighth segment with a well-developed tergum, the sternum represented by a pair of small setulose plates. Seventh segment normal, the sternum much broader than long, with marginal and a few discal bristles. Sixth segment similar to the seventh, the tergum containing the sixth spiracles, and the seventh spiracles set in the membrane just posterior to the tergum. Spermathecae roughly elongate oval in shape with an apical indentation, the surface evenly and distinctly corrugated. Duct base weak, slender, not curved.

Larva (Figs. 280-282)

Integument reticulate, with fine depressed lines dividing the surface into smooth polygonal areas. Laterodorsal processes strong, with four to eight pairs of bifurcate lateral projections on basal half (projections weak or absent on thoracic segments); processes of caudal segment subequal, the sublateral process somewhat shorter. Lateroventral processes shorter than laterodorsals with weak, usually simple lateral projections (weak or absent on thoracic and caudal segments); dorsolaterals distinct with about six simple or bifurcate projections; dorsals weak, subequal in size to dorsolaterals, scarcely reaching posterior margins of segments. Cephalic process of first thoracic segment weak, lateral process absent. Anterior spiracular process distinct, about eight in number. Posterior

spiracular stalk situated on disc, moderately long; spiracular processes distinct, approximately at right angles to each other. Mouth hooks well-developed.

There appear to be no good specific characters in the larvae or puparia. Description based on numerous larvae and puparia of *pusio, femoralis,* and *howardi.*

Fannia pusio (Wiedemann)

Figs. 144, 144A, 209, 280

Anthomyia pusio Wiedemann, 1830, p. 437.

Fannia pusio, Malloch, 1913a, p. 623; Illingworth, 1917, p. 271; Illingworth, 1922a, p. 270; Illingworth, 1922c, p. 280; Bryan, 1934, p. 426; Seago, 1954, p. 8, Figs. 1, 2, 15; Cunningham et al, 1955, p. 620.

Homalomyia femorata Loew, 1861, p. 42; Loew, 1872, p. 93; Hagen, 1881, p. 50; Bigot, 1885, p. 268; Stein, 1897, p. 76; Aldrich, 1905, p. 538; syn. *teste* Malloch, 1913a.

This species is easily distinguished from its relatives and from most other *Fannia* by the row of long fine bristles on the ventral surface of the hind tibia in the male. The females have the parafrontals evenly grey-pollinose medially. Length 3.5-4.0 mm.

Male

Abdomen.—Median vitta quite broad, usually confluent with lateral spots at posterior margin; second segment with distinct lateral grey areas.

Legs.—F_3 with a distinct preapical swelling fading out basad; avs. absent on basal two-thirds, with six to 10 long (twice femoral diameter) apically curved bristles on the swollen portion; pvs. absent except for three or four short preapical bristles. T_3 with av., pv. and ventral rows of long (twice tibial diameter) bristles; ad. row weak, the bristles fine, with no strong median bristles.

Hypopygium.—Surstylus with only a weak and very short lateroventral process bearing a few short setulae.

Female

Parafrontals evenly grey-pollinose medially, the pollen distinctly denser next the eyes.

Larva

See subgroup description. No good specific characters known.

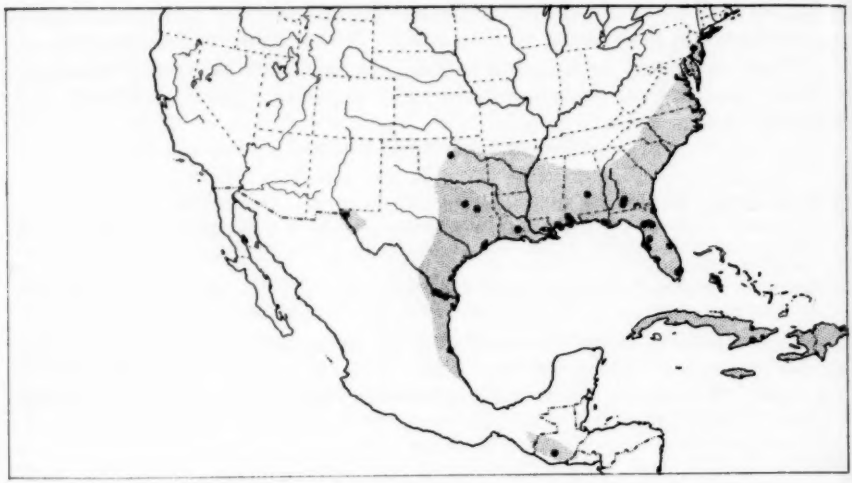
Type locality and type

South America. Type in Koniglichen Museum, Copenhagen, Denmark.

Remarks

The species has been reared from a variety of materials, such as meat, papaia stems, dead Japanese beetles, soured bread, dead cockroaches, and chicken manure (Illingworth, 1917). It is reported to make up about 20 per cent of the flies collected from chicken manure in Alabama (Cunningham et al, 1955). Illingworth (1917) also reported it as being attracted to the flowers of the algaroba. Howard (1900) reared it from larvae and pupae of *Galerucella luteola* Mill. (Malloch, 1913a). Specimens before me have been reared from dead fish, dead molluscs, dead snakes, yellow-shafted woodpecker, from decaying fungi (*Boletus felleus, B. bicolor, Halodule wrightii*), from oat straw, taken on *Quincula lobata,* from cabbage stalks, and from bollworm cage.

Seago (1954) records it from Maryland to Florida, west to Arizona and Texas, south through Cuba, Puerto Rico, Bahamas, Trinidad, and Mexico to Guatemala, as well as from Hawaii, Guadaloupe, and Guam. Specimens before me extend the range north to New York and New Jersey.



Map 52. Geographic distribution of *F. pusio* (Wied.).

Records, 92 ♂♂, 114 ♀♀ (Map 52)

NEW YORK. Riverhead, L.I., 1 ♂, 3 ♀♀; Oak Beach, L.I., 1 ♀. DISTRICT OF COLUMBIA. Washington (ex *Boletus bicolor*), 5 ♂♂, 6 ♀♀; (on cabbage stalks) 1 ♂; (on cabbage stump) 1 ♂. MARYLAND. Forest Glen (ex *Boletus felleus*), 3 ♂♂, 4 ♀♀; Chesapeake Beach, 3 ♂♂. NEW JERSEY. Riverton, 1 ♀; Atlantic City, 1 ♂. FLORIDA. Homestead, 1 ♂, 4 ♀♀; Gainesville, 1 ♀; Gainesville (Agric. Expt. Station), 4 ♂♂, 1 ♀; Panama City (ex *Halodule wrightii*), 1 ♂; Panama City (Bishopp No. 24255), 2 ♂♂; Miami, 2 ♂♂, 1 ♀ (ex dead fish), 4 ♀♀; St. Petersburg, 1 ♂; Punta Gorda, 1 ♂, 1 ♀; Lacoochee, 1 ♂; Palatka, 2 ♂♂; Lake Worth (on dead mocassin), 1 ♂; Newbury, 2 ♂♂; Jacksonville, 1 ♂; Vero Beach, 21 ♀♀; Likely, 1 ♀; Bradenton, 18 ♂♂, 16 ♀♀; no locality (on dead molluscs), 4 ♂♂, 4 ♀♀ (with puparia). GEORGIA. Thomasville, 3 ♀♀, (reared ex yellow-shafted woodpecker) 1 ♂; Tifton, 2 ♂♂, 4 ♀♀; Okefenokee Swamp Park, 3 ♀♀. ALABAMA. Kushla, 2 ♂♂, 1 ♀; Theodore ("reared from *S. drumendi*"), 3 ♂♂, 3 ♀♀; Montgomery, 8 ♀♀. MISSISSIPPI. Horn Island, 1 ♂; Pass Christian, 3 ♀♀. LOUISIANA. Opelousas, 5 ♂♂, 1 ♀. OKLAHOMA. Stillwater, 1 ♀. TEXAS. San Antonio, 1 ♂; Sierra Blanca, El Paso Co., 1 ♂; Dallas, 3 ♂♂, (ex oat straw) 3 ♀♀; 5 mi. East of Rio Grande (at *Quincula lobata*), 2 ♀♀; Weslaco, 1 ♂; Pharr, 1 ♂, 1 ♀; College Station, 1 ♀; Brownsville (ex bollworm cage), 14 ♂♂, 11 ♀♀; Galveston, 1 ♂.

Collecting dates from April 6 to December 25.

Fannia femoralis Stein

Figs. 145, 145A, 210, 281

Homalomyia femoralis Stein, 1897, p. 282; Aldrich, 1905, p. 537.

Fannia femoralis, Malloch, 1913, p. 627; Malloch, 1918, p. 292; Stein, 1920, p. 44; Malloch, 1924, p. 418; Illingworth, 1926a, p. 400; McAtee, 1929, p. 107; Engel, 1931, p. 136; Seago, 1954, p. 6, Fig. 6; Tilden, 1957, p. 24; Reed, 1958, p. 239.

This species is closely similar to *pusio*, but the males lack the long ventral hind-tibial bristles, and have shorter preapical hind-femoral bristles. The females are virtually inseparable from the females of *pusio*.

Male

Abdomen.—Median vitta narrow, with lateral spots at most partially confluent, second segment entirely brown-pollinose.

Legs.—F_3 as described for *pusio*, but the preapical avs. long, thrice femoral diameter, and preapically curled; preapical pvs. somewhat shorter and not curled. T_3 with one av., a row of six to eight subequal ads., no ventrals or pvs.

Hypopygium.—Surstylus with a strong and distinct ventrolateral process projecting parallel to inner process and bearing several strong setulae.

Female

Parafrontals weakly and uniformly brownish-grey-pollinose, not distinctly denser laterally.

Larva

See subgroup description. No good specific characters known.

Type locality and type

Opelousas, Louisiana. Type in Hough Collection (Chicago Natural History Museum), Chicago, Illinois; examined by me April, 1958.

Remarks

This species is known to be attracted to and to oviposit in the carcass of a dead cat (Illingworth, 1926b); and has been reared from cow manure (Tilden, 1957). Specimens before me have been reared from chicken manure and human excreta, and been taken on apple trees. McAtee (1929) records three puparia of this species from the nest of *Sturnus vulgaris*.

Seago (1954) records this species from Illinois and West Virginia to Georgia, and from California south into Mexico.

Records, 47 ♂♂, 36 ♀♀ (Map 53)

MONTANA. Lake MacDonald, Glacier Park, 2 ♀♀; Flathead Lake, 1 ♀. UTAH. Orr's Ranch, Skull Valley, 1 ♂. KANSAS. Wichita, 1 ♀; Bourbon Co., 1 ♂; Douglas Co., 1 ♂. ILLINOIS. Plainview, 2 ♂♂. NORTH CAROLINA. Wilmington (ex human excreta), 1 ♂, 3 ♀♀. GEORGIA. Dekalb Co., 6 ♂♂, 4 ♀♀; Kennesaw Mt., Cobb Co., 1 ♂. ALABAMA. Auburn (ex chicken manure), 7 ♂♂. LOUISIANA. Opelousas (type series). TEXAS. Brownwood, 1 ♂; Uvalde, 2 ♂♂, 1 ♀; Marathon, 1 ♂; Brownsville, 1 ♀; Menard, 2 ♂♂, 2 ♀♀; Dallas, 1 ♂, 4 ♀♀; Bardoro, 1 ♂. NEW MEXICO. Socorro, 1 ♂; Alamogordo, 3 ♀♀. ARIZONA. Yavapai Co., 1 ♂; Chiricahua Mts. (Rustler's Peak), 1 ♀; Cave Creek Canyon, 5 ♀♀; Phoenix (C.D.C. fly trap), 2 ♂♂; Winslow, 1 ♂. CALIFORNIA. Upland, 1 ♂, 1 ♀; Benton, Mono Co., 1 ♂; Live Oak Area, Santa Cruz Co., 1 ♂; Lindsay, 1 ♂; Hemet (ex chick excreta), 4 ♂♂, 2 ♀♀; Vacaville, 1 ♀; Victorville, 2 ♂♂, 3 ♀♀; Sheep Creek Springs, Death Valley, 3 ♀♀. MEXICO. Mexico City, 1 ♂, 1 ♀.

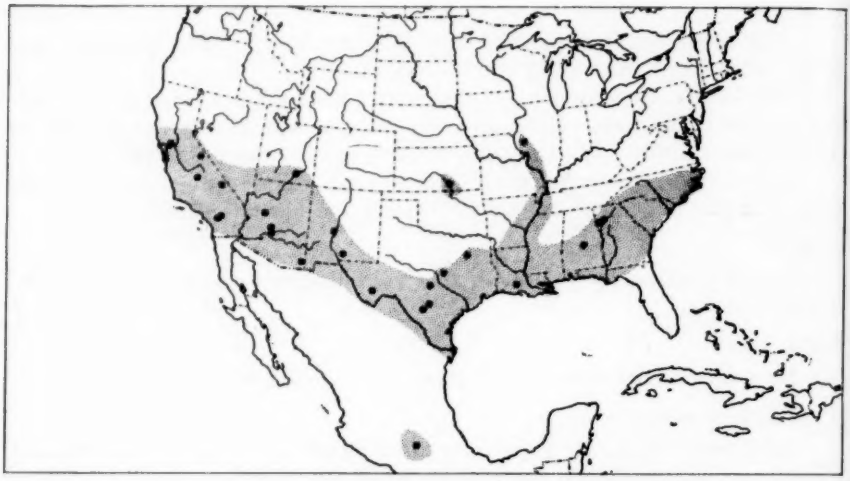
Collecting dates from May 21 to December 13, with the majority in June and July.

***Fannia howardi* Malloch**

Figs. 147, 147A, 212, 282

Fannia howardi Malloch, 1913a, p. 626; Seago, 1954, p. 6, Figs. 8, 17; Reed, 1958, p. 13.

This species is very similar to *trimaculata* Stein and has been frequently misidentified as that species. All Nearctic records of *trimaculata* that I have been able to check have turned out to be either *howardi* or *leucosticta*. The males of



Map 53. Geographic distribution of *F. femoralis* Stein.

these three species are very similar. All have the hind femur unmodified with a more or less complete row of erect anteroventral bristles. However, in *howardi* the anteroventrals are short and regular with one strong preapical, whereas in *leucosticta* they are longer and increase evenly to about four strong preapicals. In *trimaculata* there is a median row of seven or eight short bristles and one strong preapical.

The females of *howardi* and *trimaculata* are closely similar to each other and to that of *femoralis*, whereas the female of *leucosticta* has the apical segments of the abdomen trimaculate.

Male

Abdomen.—Median vitta moderately broad, not or scarcely confluent with lateral spots; second segment with distinct lateral grey areas.

Legs.—F_3 not swollen preapically, avs. erect and weak (two-thirds femoral diameter) with one strong preapical; pvs. erect and setulose with three to five long strong preapicals (these apparently continuous with the post-posteroventral row). T_3 with one av., six to eight weak ads. (usually one distinctly stronger); no ventrals or pvs.

Hypopygium.—Surstylus with ventrolateral process virtually absent, represented by a strong ventral swelling which bears several setulae.

Female

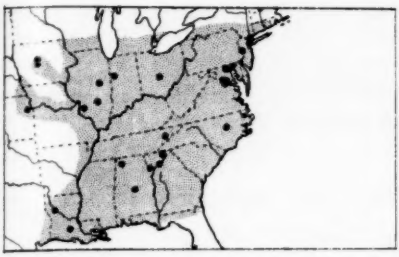
Parafrontals evenly greyish-pollinose with the pollen slightly denser laterally.

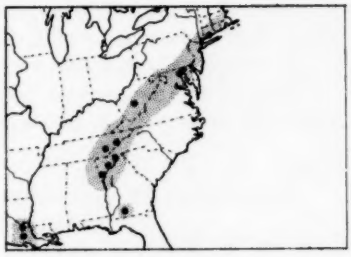
Larva

See subgroup description. No good specific characters known.

Type locality and type

Hollyspring, Mississippi. Type in U.S. National Museum, No. 15444; examined by me April, 1957.





Maps 54-55. Geographic distributions of *Fannia* spp. 54, *howardi* Mall. 55, *snyderi* Seago.

Remarks

The paratype material was reared from larvae and pupae of *Galerucella luteola* Muller.

Specimens before me have also been reared from a starling nest, dead *Lachnosterna* adults, from *Coprinus attramentarius*, from squirrel carrion, and from human dung.

Seago (1954) records this species from New York and Michigan south to Georgia and Louisiana.

Records, 72 ♂♂, 73 ♀♀ (Map 54)

Iowa. Ames, 1 ♀; Ankeny, 1 ♀. Kansas. Lawrence, 1 ♀. Illinois. Urbana, 3 ♂♂, 4 ♀♀; Dubois, 1 ♀; Greenup (ex human dung), 2 ♂♂, 1 ♀. Indiana. Lafayette, 10 ♂♂, 10 ♀♀ (ex *Lachnosterna* adults); 3 ♂♂, 2 ♀♀. Ohio. Columbus, 1 ♂. Connecticut. Stanford (on dead turtle), 1 ♂. New York. Flushing, 1 ♂. New Jersey. New Brunswick, 1 ♀; Lucaston, 1 ♀. District of Columbia. Washington, 4 ♂♂, 3 ♀♀ (ex *Coprinus attramentarius*), 1 ♀ (ex elm leaf beetle), 1 ♂, 1 ♀. Maryland. College Park, 1 ♀; Edgewood (lab colony), 2 ♂♂, 4 ♀♀; Bell (ex starling nest), 3 ♂♂, 9 ♀♀. Virginia. Falls Church, 2 ♂♂; Great Falls, 1 ♀; Snicker's Gap, 1 ♂ (with puparium); Leesburg, 1 ♂ (on human faeces). Tennessee. University of Tennessee Farm, Knox Co., 2 ♂♂, 11 ♀♀. North Carolina. Raleigh, 2 ♂♂. Georgia. Kennesaw Mt., Cobb Co., 6 ♂♂; Rabun Co., 6 ♂♂; Stone Mt., Dekalb Co., 8 ♂♂; Dekalb Co., 1 ♂. Alabama. Montgomery, 1 ♂; Wilson Dam F.Q., 2 ♂♂, 2 ♀♀. Louisiana. Robeline, 1 ♂; Opelousas, 4 ♂♂, 6 ♀♀. Mississippi. Holly Spring, 7 ♂♂ (type series), 9 ♀♀.

Collecting dates from February 3 to December 13, with the majority in July.

Fannia snyderi Seago

Figs. 146, 146A, 213

Fannia snyderi Seago, 1954, p. 2, Figs. 5, 18-20.

This species is related to *femoralis*, but is clearly distinguished by the distinctly tuberculate hind femur, the tubercle being densely bristled, with the anteroventral and posteroventral surfaces basally bare. The female can be recognized by the shiny black inner margins of the parafrontals.

Male

Abdomen.—Median vitta moderately broad, not or scarcely confluent with lateral spots; second segment with lateral grey areas.

Legs.–F_3 with a distinct rounded tubercle preapically, bearing many short bristles only as long as femoral diameter; basally with only setulae. T_3 with one av., six to eight subequal ads.; no ventrals or pvs.

Hypopygium.–Surstylus with ventrolateral process strong, forming an acute angle with inner process, and bearing several strong setulae.

Female

Parafrontals evenly pollinose laterally, their inner halves glossy black.

Type locality and type

Baltimore, Maryland. Type in the American Museum of Natural History; examined by me in February, 1955.

Remarks

This species has been cultured in the laboratory by F. M. Snyder and bred from a starling's nest (Seago, 1954). Also before me is a specimen reared from a dead turtle.

Seago (1954) recorded the species from Maryland, West Virginia, Tennessee, Louisiana, and Georgia. The only new state record in the material before me is for Connecticut.

Records, 66 ♂♂, 52 ♀♀ (Map 55)

CONNECTICUT. Stanford (in dead turtle), 1 ♀. MARYLAND. Baltimore, 51 ♂♂, 41 ♀♀ (type series); Bell (ex starling nest), 2 ♂♂ (paratypes). WEST VIRGINIA. Charleston, 4 ♂♂ (paratypes). TENNESSEE. Knox Co., 1 ♂ (paratype), 7 ♀♀; Athens, 1 ♂. GEORGIA. Thomasville, 1 ♂ (paratype), Dekalb Co., 2 ♂♂ (paratypes); Rabun Co., 1 ♂; Kennesaw Mt., Cobb Co., 2 ♀♀. LOUISIANA. Bunkie, 2 ♂♂ (paratypes); Opelousas, 1 ♀.

***Fannia leucosticta* (Meigen)**

Figs. 148, 148A, 211

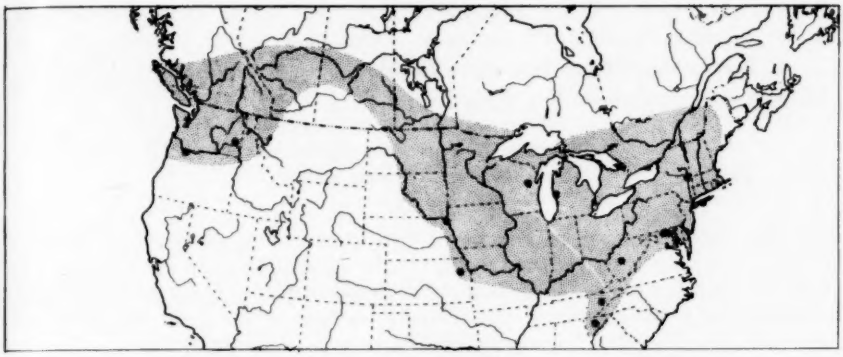
Anthomyia leucosticta Meigen, 1826, p. 328.
Homalomyia leucosticta, Stein, 1908b, p. 195.
Fannia leucosticta, Stein, 1907a, p. 661; Stein, 1909, p. 243; Stein, 1910b, p. 155; Malloch, 1913a, p. 627; Stein, 1915a, p. 28; Stein, 1918, p. 154; Stein, 1919b, p. 53; Séguy, 1923, p. 271; Bezzi, 1926, p. 566; Karl, 1928, p. 60, Fig. 44; Séguy, 1930, p. 158; Karl, 1937, p. 128; Frey, 1937, p. 134; Ouchi, 1938, p. 19; Séguy, 1945, p. 153; Figs. 2, 3; Zimin, 1945, p. 31; Tiensuu, 1946a, p. 66; van Emden, 1948, p. 168; Seago, 1954, p. 7, Fig. 10; Hennig, 1955, p. 56, Text Fig. 13, Figs. 47, 69; Sytschovskaja, 1957, p. 111; Reed, 1958, p. 239.
Homalomyia brevis Rondani, 1866, p. 132; Rondani, 1877, p. 47; Stein, 1895, p. 51; Stein, 1898, p. 176; Pandellé, 1899, p. 199; Howard, 1900, p. 580; Aldrich, 1905, p. 537; Wingate, 1906, p. 280; syn. *teste* Stein, 1900, p. 154.
Azelia gibberoides Schnabl and Dziedzicki, 1911, p. 276; syn. *teste* Hennig, 1955, p. 56.

This species appears to be the most primitive species of the *pusio* subgroup. It has the most primitive femoral structure and bristling, surstylus structure, and female abdominal coloration. It is also the most widespread species of the subgroup and is, in fact, almost cosmopolitan.

Its closest relative is *howardi,* which has a single strong preapical anteroventral on the hind femur. *F. leucosticta* can be recognized in the male by the full row of strong anteroventrals on the unmodified hind femur and in the female by the trimaculate apical abdominal segments.

Male

Thorax.–Squamae dark brown, haltere deep yellow (unique).



Map 56. Geographic distribution of *F. leucosticta* (Meig.).

Abdomen.—Pollen silvery-grey (bluish in all other species), median vitta broad, partially confluent with distinct large lateral spots; markings on fifth segment weak to absent. Second segment entirely dark brown.

Legs.—F_3 normal, not preapically swollen; avs. long, evenly increasing to four strong preapicals; pvs. as slender erect setulae to two-thirds, followed by two strong bristles, preapical portion bare.

Hypopygium.—Surstylus almost identical with that of *howardi,* but ventrolateral process completely absent, surstylus evenly tapering toward the tip.

Female

Head.—Parafrontals evenly and heavily grey-pollinose.

Thorax.—Greyish, with distinct, although very narrow, brown vittae.

Abdomen.—First three segments bluish-brown-pollinose, last two with a median vitta and distinct lateral spots on pale-greyish ground color.

Type locality and type

Not given; probably in the vicinity of Aachen, Germany. Type in Muséum d'Histoire Naturelle de Paris.

The species has been found in nests (Séguy, 1945), in a starling's nest (Hennig, 1955), and has been reared from dead unparasitized *Nomadacris septenfasciata* (Ouchi, 1938). It has been captured in numerous fly-traps (Seago, 1954). Specimens before me have been reared from mink and pig excrement.

This species is known in the Old World from France and Germany south to the Canary Islands and Rhodesia, and east to Formosa, Shanghai, and Java.

In the Nearctic region it is recorded from New York and Wisconsin south to Kansas and Georgia with one record from Oregon (Seago, 1954). Specimens before me extend the range west to Washington and north to Ontario.

Records, 12 ♂♂, 18 ♀♀ (Map 56)

WASHINGTON. Pullman, (ex mink excrement) 1 ♂, (ex pig excrement) 2 ♀♀. OREGON. Portland (Seago, 1954). KANSAS. Topeka (Seago, 1954). WISCONSIN. Clintonville (Seago, 1954). MICHIGAN. Muskegon (Seago, 1954). IOWA. Sioux City, 1 ♂. ONTARIO. Midland, 1 ♂. NEW YORK. Riverhead, L.I., 2 ♀♀; Troy (Seago, 1954). MARYLAND. Baltimore, 3 ♂♂, 4 ♀♀;

Edgewood, 2 ♀♀. WEST VIRGINIA. Charleston (Seago, 1954). TENNESSEE. Knox Co. (U.T. Farm), 1 ♀. GEORGIA. Dekalb Co., 7 ♀♀.

Collecting dates from June 23 to October 10.

I have also examined 1 ♀ from Korea.

Species of Uncertain Affinities

Fannia robusta, new species

Fig. 162

This species, known only from the female, cannot be satisfactorily included in either the *scalaris* or *mutica* groups, for the general bristling has characters of both, whereas the hind tibia lacks the mid-dorsal bristle, and the genitalia appear to be of an extreme *mutica* type. Easily recognized from all others by the hind-tibial bristling and the strongly spatulate palpi. Length 4.5 mm.

Female

Head.—Parafrontals one-third as wide as long, subshining black, separated by a black frontal vitta 1.5 times as wide as either parafrontal. Frontal bristles about nine, of which four or five are strong; lower orbital set well toward the eye; parafrontal setulae strong, in three irregular rows. Parafacial narrow, bare, brownish-pollinose. Occipital bristles short, regular. Postoccipital row of setulae complete. Second antennal segment with one strong bristle; third segment scarcely longer than broad, distinctly swollen; arista subpubescent. Palpus distinctly broadened and spatulate, flattened dorsally but angularly truncated ventrally. Theca weakly swollen, lightly pollinose.

Thorax.—Black, lightly brownish-pollinose. Acr. bristles triserial presuturally, becoming irregularly quadriserial postsuturally. Accessory setulae sparse, short, and intraalar setulae extending laterally over prealar area; no distinct pra. Propleuron bare. Stigmatal setulae none or one. Mesopleurals moderate, not stronger dorsally. Anterior sternopleural bristle weak. Scutellum bare discally. Squamae pale yellowish-brown, the lower slightly larger and distinctly projecting. Haltere brownish-yellow. Wing veins pale brown, membrane clear.

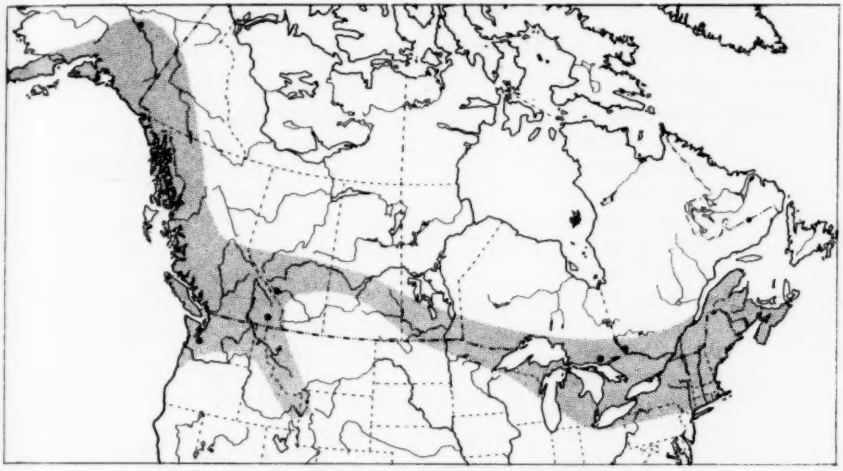
Abdomen.—About 1.8 by 2.2 mm., evenly subshining black.

Legs.—F_1 pvs. becoming weaker basad. T_1 with a weak median ad. F_2 avs. and pvs. short and erect, slightly stronger basally. T_2 with one ad., no pd. F_3 with three or four preapical avs. strong. T_3 with two or three avs., a full ad. row, *no* median dorsal.

Ovipositor.—Basically of the *mutica* type (cf. *immutica*) but much more strongly modified. Subanal plate with three rows of marginal setulae. Eighth tergum normal, the sternum developed into a bilobed projecting pad with strong, curved, basal apodemes. Seventh segment normal, the sternum broader than long with only one row of bristles. Sixth segment similar to seventh, the sixth spiracle set in the tergum, the seventh spiracle in membrane just behind the tergum. Spermathecae three, smooth surfaced, with a slender, weakly curved duct base. In the specimens examined, the spermathecae are partially collapsed, but probably were roughly spherical in shape without an apical indentation.

Types

Holotype.—♀, Cranbrook, British Columbia, 25.V.1918 (C. B. Garrett). (C.N.C. No. 6685).



Map 57. Geographic distribution of *F. robusta* Chill.

Paratypes.–7 ♀ ♀, as follows: ALBERTA. 1 ♀, Banff, 8.VIII.1923 (Owen Bryant). ALASKA. 1 ♀, Fairbanks (10 mi. S.E.), 24.VI.1948 (M. Ridenour). WASHINGTON. 2 ♀ ♀, Paradise Inn, 19.VII.1931. ONTARIO. 1 ♀, Sudbury, 14.VII.1889. QUEBEC. 1 ♀, Laniel, 19.VI.1931 (H. S. Fleming); 1 ♀, Mistassini, 13.VII.1956 (J. R. McGillis) (Map 57).

Unrecognized Species

Homalomyia leydyi and *H. wilsoni* Walsh, 1870, p. 137.

Both were described from the larvae, and can be recognized only as belonging to the *scalaris* subgroup, as the descriptions are too vague for further precision.

Species Erroneously Described in the Genus

Homalomyia dentata Bigot, 1885, p. 284.
= *Limnophora narona* (Walker), syn. *teste* Séguy, 1937.
Homalomyia rupecula Bigot, 1885, p. 285.
= *Hylemyia cilicrura* (Rondani), syn. *teste* Séguy, 1937.
Fannia pretiosina Curran, 1930, p. 86.
Is an *Azelia*.

Species Recorded from North America but not Seen by the Author

Fannia fasciculata (Loew), recorded by Smith, 1900, p. 680.
(Determination by C. W. Johnson). Probably a misidentification of *F. curvipes* Malloch.

Fannia flavipalpis Stein, recorded by Stein, 1920, p. 44.
Record due to a confusion of this species with *F. benjamini* Malloch.

Fannia ornata (Meigen), recorded by Malloch, 1931a, p. 631.
Record possibly based on a European specimen.

Fannia polychaeta (Stein), recorded by various authors.
This species is frequently confused with *brevipalpis* and *neopolychaeta*, new species. I have seen most of the specimens on which the misidentifications were based.

Fannia trimaculata Stein, recorded by Malloch, 1913a, p. 623.
A misidentification of *howardi* Malloch or *leucosticta* (Meigen).

Species of the Holarctic Region Arranged in Species Groups

(Species not occurring in the Nearctic region are marked by *, Holarctic species by †).

scalaris group
- *scalaris* subgroup
  - †*incisurata* (Zett.)
  - *trianguligera* Mall.
  - *annosa* Chill.
  - †*coracina* (Loew)
  - †*scalaris* (Fab.)
  - **subscalaris* Zimin
  - **pseudoscalaris* Séguy
  - †*atripes* Stein
  - **ciliata* (Stein)
  - *ciliatissima* Chill.
  - **monilis* (Hal.)
  - *enotahensis* Seago
  - **bifimbriata* Collin
  - †*manicata* (Meig.)
  - **rabdionata* Karl (?)
- *fuscula* subgroup
  - **bamata* (Macq.)
  - *pellucida* (Stein)
  - †*vesparia* (Meade)
  - *presignis* Chill.
  - †*fuscula* (Fall.)
  - *americana* Mall.
  - **kikowensis* Ouchi

mutica group
- †*mutica* (Zett.)
- †*immutica* Collin
- *oregonensis* Chill.

lugubrina group
- †*lugubrina* (Zett.)
- †*tuberculata* (Zett.)
- †*genualis* (Stein)
- *falcata* Chill.
- *hinei* Chill.
- **limbata* (Tiensuu) (?)
- **krimensis* Ringd. (?)

hirticeps group
- †*hirticeps* (Stein)
- *lasiops* Mall.
- *ungulata* Chill.
- **cothurnata* Collin
- **nidica* Collin
- **barbata* (Stein)
- **armata* (Meig.)
- †*atra* (Stein)
- **berolinensis* (Hennig) (?)

postica group
- *postica* subgroup
  - †*postica* (Stein)
  - **p. parapostica* Hennig
  - *brevicauda* Chill.
  - *multisetosa* Chill.
  - *flavibasis* (Stein)
  - *sequoiae* Chill.
  - *enigmata* Chill.
- *spathiophora* subgroup
  - †*spathiophora* Mall.
  - *bigelowi* Chill.
  - *brooksi* Chill.
  - †*aethiops* Mall.
  - **umbratica* Collin
  - *tundrarum* Chill.
  - **umbrosa* (Stein)
  - **ringdahlana* Collin
  - *scyphocerca* Chill.

carbonaria group
- *carbonaria* subgroup
  - †*carbonaria* (Meig.)
  - *melanura* Chill.
  - *borealis* Chill.
  - *lucida* Chill.
  - **norvegica* Ringd.
  - *garretti* Chill.
  - †*corvina* (Verrall)
  - *fuscitibia* Stein
  - **coracula* Collin
- *minutipalpis* subgroup
  - †*minutipalpis* (Stein)
  - *brevipalpis* Chill.
  - *trigonifera* Chill.
  - **polychaeta* (Stein)
  - **nitida* (Stein)
  - *neopolychaeta* Chill.

kowarzi group
- †*kowarzi* (Verrall)

pretiosa group
- **pretiosa* (Schin.)
- *penepretiosa* Chill.
- *depressa* (Stein)
- *elongata* Chill.
- *neomexicana* Chill.
- *leucogaster* Chill.
- *curvipes* Mall.

pretiosa group (cont.)
arcuata Chill.
gilvitarsis Chill.
**fasciculata* (Loew)

benjamini group
benjamini subgroup
benjamini Mall.
conspicua Mall.
tescorum Chill.
arizonensis Chill.
operta Chill.
neotomaria Chill.
setifer subgroup
setifer Chill.
vittata subgroup
clavata Chill.
micheneri Chill.

serena group
serena subgroup
†*serena* (Fall.)
**similis* (Stein)
intermedia Chill.
bradorei Chill.
immaculata Mall.
meridionalis Chill.
**carbonella* (Stein)
abrupta Mall.
**nigra* Mall.
**pallitibia* (Rond.)
**pruinosa* (Meig.)
sociella subgroup
†*sociella* (Zett.)
**spinosa* Karl
ochrogaster (Thoms.)
macalpinei Chill.
**ornata* (Meig.)
aerea subgroup
†*aerea* (Zett.)
**verrallii* (Stein)
**parva* (Stein)
serrata Chill.

canicularis group
canicularis subgroup
†*canicularis* (L.)
**pubescens* Stein
†*subpubescens* Collin
nidicola Mall.
**prisca* Stein
**hirundinis* Ringd.
**aequilineata* Ringd.
**latipalpis* (Stein) (?)
†*difficilis* (Stein)
morrisoni Mall.
variabilis Chill.
**clara* Collin
**speciosa* (Vill.)
alaskensis Chill.
tibialis Mall.
pallidiventris Mall.
**vespertilionis* Ringd.
ceringogaster Chill.
**hylemyiaeformis* Ringd.
binotata Chill.
glaucescens subgroup
†*glaucescens* (Zett.)
laevis (Stein)
latifrons Mall.
**lineata* (Stein)
pusio subgroup
pusio (Wied.)
snyderi Seago
†*leucosticta* (Meig.)
howardi Mall.
femoralis Stein

Species of Questionable Affinities
**gotlandica* (Ringd.)
**observanda* (Rond.)
**rivularis* (R.-D.)
**turkmenorum* Stack.
**latifrontalis* Hennig
robusta Chill.

GENUS *EURYOMMA* STEIN

Euryomma Stein, 1899, p. 19; Stein, 1907a, pp. 666, 751; Schnabl and Dziedzicki, 1911, p. 129; Stein, 1916, p. 82; Stein, 1919a, pp. 95, 135; Séguy, 1923, p. 256; Séguy, 1937, p. 180; Séguy, 1941b, p. 54; van Emden, 1941, p. 273; Stuardo, 1946, p. 157; Hennig, 1955, p. 14; Albuquerque, 1956, p. 1; Chillcott, 1958b, p. 725.

Type species.—*Anthomyia peregrinum* Meigen, by monotypy.

This is the second-largest genus of the subfamily with one cosmopolitan, seven Neotropical, and one (new) Nearctic species. There are probably several more species to be described from the Neotropical region.

It may be characterized as follows: Head with oral margin not protruding, male with two orbital bristles (no head dimorphism), arista short to long pubescent. Thorax with a weak anterior and a strong posterior presutural dorsocentral; two strong sternopleurals with occasionally a median bristle-like setula. Wing with second anal vein weakly curved forward so as to intersect an extension of the first anal vein at or just before the margin of the wing, costal spine not developed. Abdomen broadest before posterior margin of second segment, that segment parallel-sided on apical half and not half as long as broad. Abdomen pollinose, weakly marked. Male hypopygium with no bacilliform process, aedeagus well sclerotized and elongate. Spermathecae two, spherical in shape, duct base attaching at a sharp angle.

The larvae are known for only two Panamanian species (Chillcott, 1958b). They are similar to those of *Platycoenosia* and the *F. canicularis* group, but can be distinguished by the pebbled or spiculate, not reticulate, integument.

Key to Nearctic Species

1. All femora black (Neotropical) ..... two Panamanian spp. and *nigrifemur* Stein
   All femora yellow 2
2. Palpi yellow 3
   Palpi black ..... other Neotropical spp.
3. Third antennal segment entirely black, T_1 ad. present, humeri concolorous ..... *peregrinum* (Meigen)
   Third antennal segment largely yellow, T_1 ad. absent, humeri contrastingly yellow ..... *americanum*, new species

***Euryomma peregrinum* (Meigen)**

Figs. 149, 149A-B, 217, 259

Anthomyia peregrinum Meigen, 1826, p. 187.
Euryomma peregrinum, Stein, 1907a, p. 666; Stein, 1908a, p. 99; Stein, 1908b, p. 195; Stein, 1908c, p. 13; Schnabl and Dziedzicki, 1911, p. 129, Figs. 355, 356, 833; Stein, 1910c, p. 73; Stein, 1911, p. 111; Stein, 1913a, p. 24; Stein, 1915a, p. 28; Stein, 1918, p. 154; Stein, 1920, p. 46; Séguy, 1923, p. 256, Fig. 499b; Malloch, 1924c, p. 146; Frey, 1937, p. 135; Harrison, 1953, p. 10; Hennig, 1955, p. 14, Figs. 3, 61.
Anthomyia communis Walker, 1856, p. 366; syn. *teste* Stein, 1901, p. 193; Huckett, 1934, p. 136.
Euryomma communis, Stein, 1901, p. 193; Aldrich, 1905, p. 540.
Homalomyia schembrii Rondani, 1866, p. 127; Rondani, 1877, p. 60; syn. *teste* Stein, 1907a, p. 666.
Coenosia pseudomollicula Frauenfeld, 1867, p. 450; syn. *teste* Stein, 1919, p. 133.
Anthomyia brevipalpis Thomson, 1868, p. 557; syn. *teste* Stein, 1910, p. 73.
Euryomma hispaniense Stein, 1899, p. 20; Stein, 1901, p. 193; syn. *teste* Stein, 1907a, p. 666.
Hoplogaster dubium Grimshaw, 1901, p. 42; syn. *teste* Stein, 1919, p. 133.

This species is widespread throughout the world, but in North America is recorded only from the eastern half, being replaced in California by *americanum*. It can be distinguished from Neotropical species by the yellow palpi and from the western Nearctic species by the dark third antennal segment and the foretibial anterodorsal bristle. Additional characters are the yellow legs, dark humeri, yellowish-brown-pollinose frontal vitta, and subpubescent arista. Length 3.0-4.0 mm.

Male

Head.—Structurally similar to the females of the genus *Fannia*, with a broad frontal vitta, and two to three strong and several weak frontal bristles. Parafrontals one-third as broad as long, yellowish-brown-pollinose, separated by a dark yellowish-brown-pollinose frontal vitta as broad as either parafrontal. Upper orbital bristle set just anterior to the anterior ocellus, reclinate; lower orbital set distinctly behind the upper frontal bristle, directed lateroposteriorly.

Parafrontal setulae uniserial. Parafacials with a few setulae on upper half. Occipital bristles short, regular. Postoccipital bristles absent. First two antennal segments yellow; third segment black, 1.5 times as long as broad; arista black, subpubescent. Palpus yellow; theca slender, weakly sclerotized, pollinose.

Thorax.—Greyish- to yellowish-brown-pollinose, with three faint brownish vittae along the bristle rows; scutellum apically yellowish. First presutural dorsocentral bristle very weak, less than one-third as long as the second. Acr. bristles rather evenly triserial. Accessory setulae weak and sparse. Pra. two, set one above the other, upper one distinctly weaker. Propleuron bare. One strong and one weak stigmatal bristle. Mesopleural setulae very sparse, not stronger dorsally. Sternopleuron with one weak median bristle. Scutellum with only subbasal and preapical pairs of marginals strong, with a pair of weak marginal setulae basally and a stronger pair preapically on the disc. Squamae subequal, yellowish, margins darker. Haltere deep yellow. Wing clear, the veins yellowish.

Abdomen.—0.9 by 1.5 mm. Integument largely yellowish, more or less obscured by an even covering of bluish-brown to yellowish-brown pollen, a darker linear median vitta only weakly indicated. Hypopygium weakly projecting.

Legs.—Yellow, only tarsi black. F_1 pvs. evenly increasing from base to apex, the preapical one or two bristle-like. T_1 with a median ad. F_2 avs. short (half femoral diameter), weak, becoming closer-set apically to form a weak comb; pvs. similar, becoming stronger apically, with a weak duplicating row ventrally on the median third. T_2 only slightly thicker apicad, with a short weak multiserial ventral mat; one ad., one pd. C_3 with one weak bristle-hair posteroventrally. F_3 avs. setulose except for two strong preapical bristles; pvs. setulose. T_3 with one av., one ad.

Hypopygium.—Weakly bristled dorsally, bare on ventral half. Cercal plate long and slender, projecting apically as a curved tubular process. Surstylus distinctly separated and freely articulated, tapering more or less evenly toward apex. Bacilliform process absent. Ninth sternum broad, with produced inner basal angles and broad lateral flanges; postgonites reduced to tiny stubs behind aedeagus; aedeagus basally broad, tapering to apex and curving dorsally. Fifth sternum completely divided into two lateral processes, the bristles arranged in one irregular row, the two posterior bristles on each process strong.

Female

Head and *Thorax.*—As in the male.

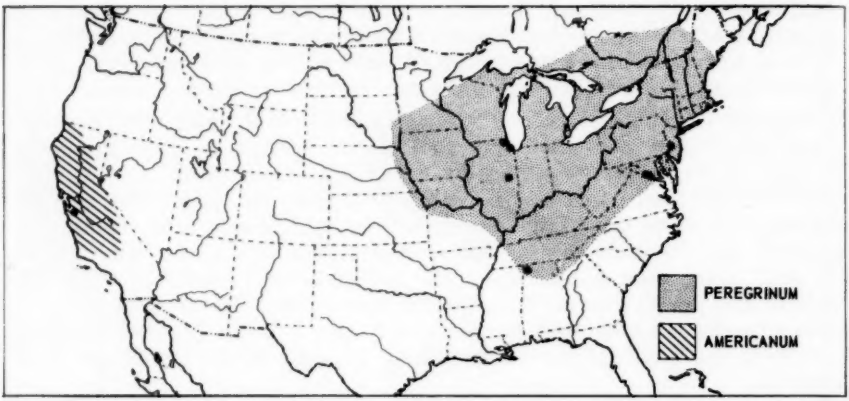
Abdomen.—Yellow, lightly pollinose, the pollen changing from yellowish-white basally to brownish-yellow apically.

Legs.—As in the male, but F_2 pvs. weak and uniserial; T_2 ventral mat absent.

Ovipositor.—Subanal plate broader than long, evenly setulose. Cerci normal. Eighth tergum normal, the sternum reduced to a pair of small setulose plates, each with a long slender process running anteriorly. Seventh segment long and slender, the sternum longer than broad with one row of marginal setulae. Sixth segment similar, the tergum enclosing both the sixth and seventh spiracle. Spermathecae two, spherical, with the duct base weakly swollen and arising at an acute angle from the sides of the spermathecae.

Type locality and type

Hamburg, Germany. Type location not known.



Map 58. Geographic distributions of *E. peregrinum* (Meig.) and *E. americanum* Chill.

Remarks

This species was reared by Harrison (1953) in New Zealand from *Macrocystis* compost.

It is known in the Palaearctic region from Algeria, Malta, Canary Islands, Madeira, and Greece. It has been recorded from Formosa, Hawaii, Australia, New Zealand, Chile, and Peru.

In the Nearctic region Stein (1920) recorded it from Chicago. It probably occurs all over the eastern half of the United States.

Records, 6 ♂ ♂, 16 ♀ ♀ (Map 58)

ILLINOIS. Algonquin, 1 ♂; Chicago, 1 ♀ (Stein, 1920), 11 ♀ ♀ (before me); Urbana, 1 ♂, 1 ♀. PENNSYLVANIA. Philadelphia, 1 ♂. DISTRICT OF COLUMBIA. Washington, 1 ♂. MARYLAND. Plummer's Island, 1 ♀. VIRGINIA. Rosslyn, 1 ♂; Del Ray, 1 ♀. ALABAMA. Florence (polio study trap), 1 ♂, 2 ♀ ♀.

I have also examined specimens from South Greenland, Peru, Chile, Sumatra, and Honolulu, Hawaii.

Euryomma americanum, new species

Figs. 150, 150A-B, 218

This species is very close to *peregrinum*, but differs in that the humerus and basal half of third antennal segment are yellow, and the fore tibia is bare medially. Detailed differences as follows:

Male

Head.—Frontal vitta pale orange, whitish-pollinose. Third antennal segment yellow, only the apical half to third brownish; arista basally yellow.

Thorax.—Greyish-pollinose with humerus and tip of scutellum yellow. Pra. two, set one behind the other, anterior one stronger. Sternopleuron with no trace of a weak bristle. Squamae whitish, haltere pale yellow.

Abdomen.—Bluish-brown-pollinose, with only faint traces of yellow integumental color; median vitta absent.

Legs.—F_1 pvs. setulose except for one distinct preapical bristle. T_1 with no median ad.

Hypopygium.—Evenly setulose, the setulae somewhat clustered at base of surstylus. Cercal plate short and broad, not produced. Surstylus distinctly fused to ninth tergum, broad and not strongly tapering. Ninth sternum much more reduced; aedeagus narrower and more tubular in shape, strongly curving dorsad. Fifth sternum primitive in form, broad and with scattered setulae discally.

Female

Head and *Thorax.*—As in the male.

Abdomen.—Colored as in the male, except that the two basal segments are distinctly yellowish.

Legs.—As in the male, but F_2 pvs. weak and uniserial. T_2 ventral mat absent.

Ovipositor.—Eighth sternum completely absent. Sixth and seventh segments much shorter than in *peregrinum*, broader than long.

Types

Holotype.—♂, Santa Clara Co., California (Baker) (U.S.N.M. No. 64287).

Allotype.—♀, same data (C.N.C.).

Paratypes.—1 ♂, 1 ♀, same data as holotype. (Map 58).

GENUS *PLATYCOENOSIA* STROBL

Platycoenosia Strobl, 1894, p. 72; Stein, 1907a, p. 666; Schnabl and Dziedzicki, 1911, p. 130; Stein, 1913a, p. 7; Stein, 1916, p. 219; Séguy, 1923, p. 257; Karl, 1928, p. 69; Séguy, 1937, p. 177; Hennig, 1955, p. 16.

Choristomma Stein, 1895, p. 138. Type species *Choristomma pokornyi* Stein (=*P. mikii*), by monotypy.

This genus contains only the type species, *mikii*, which is now known to be Holarctic. Like *Euryomma* and *Piezura*, it is characterized by having very little sexual dimorphism (males with broad frons and with both orbital bristles present). In contrast to the other two genera, *Platycoenosia* has the arista distinctly plumose, and the costal spine strong.

The genus may be characterized as follows: Head with oral margin not protruding, male with two orbital bristles (no head dimorphism), arista long-plumose. Thorax with a weak anterior and a strong posterior presutural dorsocentral; two strong sternopleurals with a setulose median bristle. Wing with second anal vein weakly curved forward so as to intersect an extension of the first anal vein at or just before the margin of the wing, costal spine well developed. Abdomen broadest before posterior margin of second segment, that segment in male parallel-sided on apical half and not half as long as broad, in female distinctly longer than third segment; pollinose, not vittate or maculate. Male hypopygium with no bacilliform process; aedeagus well sclerotized and elongate. Spermathecae two, spherical in shape; duct bases very weakly developed, attaching at right angles.

Larva similar to that of *F. canicularis*, but distinguished by numerous furcate projections on laterodorsal processes and by spiculate as well as reticulate integument.

Platycoenosia mikii Strobl

Figs. 151, 151A-B, 219, 284

Platycoenosia mikii Strobl, 1894, p. 72; Stein, 1907a, p. 666; Schnabl, 1911, p. 89; Schnabl and Dziedzicki, 1911, p. 130, Figs. 357, 358, 834; Stein, 1913a, p. 7; Stein, 1916, p. 82; Séguy, 1923, p. 257, Figs. 507, 508; Karl, 1928, p. 69; Karl, 1937, p. 129; Aczél, 1940, p. 34; Hennig, 1955, p. 16, Figs. 5, 63; Reed, 1958, p. 240.

Choristomma pokornyi Stein, 1895, p. 138; syn. *teste* Stein, 1907a.
Coenosia externa Pandellé, 1899, p. 152; syn. *teste* Stein, 1907a.
Spilogaster graminicola Strobl, 1893, p. 224, ♀ (nec Zetterstedt); syn. *teste* Stein, 1907a.

Male

Length 5.0-6.0 mm.

Head.—Parafrontals greyish-brown-pollinose, one-third as broad as long, convex on inner margins, separated by a broad brownish-pollinose frontal vitta which is reddish anteriorly. Frontal bristles two to four, with a few weaker setulae; parafrontal setulae irregularly uniserial. Orbital bristles as in *Euryomma peregrinum.* Parafacials setulose on dorsal half. Occipital bristles strong, long and regular. Postoccipital bristles absent. Antenna with basal two segments yellow, third segment twice as long as wide, brown except for a narrowly yellowish base; arista basally yellowish, long plumose, hairs as long as width of third antennal segment. Palpus and theca yellow; palpus long and slender; theca subpollinose, weakly sclerotized.

Thorax.—Olivaceous brown, with three very faint brown vittae along bristle-rows. Scutellum marginally yellow. Acr. triserial, irregular postsuturally. First dorsocentral about half as long as second. Accessory setulae sparse and short. Pra. one, weak but distinct. Propleuron bare. One strong and one weak stigmatal bristle, no setulae. Mesopleurals sparse, dorsal row slightly stronger. Sternopleuron with a distinct but weak median bristle, about half the length of anterior sternopleural bristle. Scutellum as described for *E. peregrinum.* Squamae whitish, the lower slightly longer than the upper, distinctly projecting. Haltere pale yellow. Wing clear, veins yellowish-brown, costal spine strong and as long as humeral crossvein.

Abdomen.—1.7 by 2.5 mm. Yellow with second to fourth segments marginally darkened, pollen faint and whitish, median vitta indicated by a line of slightly more intense yellow coloration. Hypopygium moderately projecting.

Legs.—Yellow, tarsi black. F_1 pvs. strong, only slightly shorter basad. T_1 with a strong ad. F_2 avs. uniserial, short, close-set, becoming more crowded apically to form a comb; pvs. similar but duplicated ventrally by an irregularly triserial band of short curved setulae. T_2 weakly and evenly enlarged apicad; ventral mat short but dense; one ad., one pd. C_3 with one weak pv. bristle-hair. F_3 avs. setulose except for two or three strong preapical bristles; pvs. setulose. T_3 with one av., two or three ads., a few suberect pds.

Hypopygium.—Evenly bristled. Cercal plate quite broad, almost heart-shaped, with a blunt apex. Surstylus broad, weakly articulated with a transparent dorsal keel, and bearing a ventral row of distinct bristles. Bacilliform process absent. Ninth sternum broad with diverging apical processes; aedeagus well sclerotized and flattened, with a surrounding membranous sheath; postgonites reduced to small posterolateral stubs. Fifth sternum broader than long, with several strong lateral bristles, not distinctly crowded toward posterior margin.

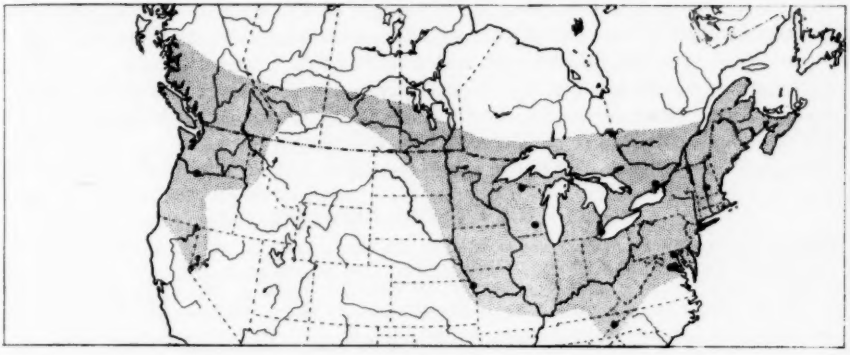
Female

Head and *Thorax.*—As in the male.

Abdomen.—Completely pale yellow.

Legs.—As in the male except: F_2 pvs. uniserial, T_2 ventral mat lacking.

Ovipositor.—Subanal plate broader than long, setulose on apical half. Cerci normal. Eighth tergum normal, the sternum represented by a small pair of setulose plates and a basal pair of bare sclerotized areas. Seventh segment



Map 59. Geographic distribution of *Pl. mikii* Strobl.

normal, the sternum broader than long, with one very irregular row of marginal bristles. Sixth segment similar in shape, the sixth spiracle enclosed in the tergum next the posterior margin, the seventh spiracle in the membrane just adjacent to the anterior margin of that tergite. Spermathecae two, large and spherical in shape, with duct bases short and weakly sclerotized.

Larva (Fig. 284)

Integument reticulate as in the *Fannia canicularis* group, but with one or two distinct spicules on each interspace. Laterodorsal processes strong, with four to six pairs of strong bifurcate lateral projections which cease abruptly at basal third (projections weak or absent on those of thoracic segments); processes of caudal segment subequal. Lateroventral processes distinct, almost as well developed as laterodorsals (weak to absent on thoracic and caudal segments); dorsolaterals weak, at most bifurcate; dorsals strong, subequal in length to laterodorsals, with numerous simple, strong, irregularly arranged projections on basal half. Cephalic process of first thoracic segment long, lateral process absent. Anterior spiracular processes distinct, about eight in number. Posterior spiracular stalk situated on disc, moderately long; spiracular processes distinct, approximately at right angles to each other. Mouth hooks well developed.

Description based on five puparia from Washington, D.C., and Marmora, Ontario; reared from *Coprinus attramentarius*, and fungus in soil.

Type locality and type

Seitenstetten, Germany. Location of type unknown.

Remarks

The species is known in Europe from Germany and France south to Hungary and Corsica. It occurs in North America from Ontario to Tennessee, west to Wisconsin and Missouri.

Specimens before me have been reared from decaying fungi, and Reed (1951) records it from dog carcasses.

Records, 19 ♂ ♂, 18 ♀ ♀ (Map 59)

ONTARIO. Pt. Pelee, 1 ♂; Marmora (ex fungus in soil), 3 ♀ ♀. NEW HAMPSHIRE. Cornish, 1 ♀. CONNECTICUT. Stanford, 1 ♀. OHIO. Wauseon 1 ♂. NEW YORK. Syosset, 1 ♂; Little Neck, 1 ♀; Fall Creek, Ithaca, 1 ♂;

Riverhead, Long Island, 1 ♂, 1 ♀. DISTRICT OF COLUMBIA. Washington (ex *Cortinarius* sp.), 3 ♂♂, 2 ♀♀; (ex *Coprinus attramentarius*), 1 ♂, 2 ♀♀ (with puparia); 2 puparia. MARYLAND. Bowie (DDT Expt.), 5 ♂♂, 2 ♀♀; Baltimore, 1 ♂; Drummond, 1 ♂, 2 ♀♀. TENNESSEE. Knox Co. (U.T. Farm), 1 ♀. WISCONSIN. Dane Co., 1 ♂, 2 ♀♀; Tenderfoot Lake, Vilas Co., 1 ♀. MISSOURI. Atherton, 1 ♂. OREGON. Hood River, 1 ♂.

Collecting dates from May 29 to September 11.

GENUS *PIEZURA* RONDANI

Piezura Rondani, 1866, p. 122; Bigot, 1882, p. 15; Stein, 1895, p. 136; Stein, 1907a, p. 666; Schnabl and Dziedzicki, 1911, p. 130; Ringdahl, 1912, p. 214; Stein, 1913a, p. 7; Stein, 1916, p. 83; Séguy, 1923, p. 257; Karl, 1928, p. 68; Ringdahl, 1934a, p. 106; Séguy, 1937, p. 177; Aczél, 1940, p. 34; Ringdahl, 1952, p. 158; Ringdahl, 1954a, p. 81; Hennig, 1955, p. 17.

Type species.—*Piezura pardalina* Rondani (= *graminicola* Zetterstedt), by monotypy.

The genus contains only two species, *graminicola* Zetterstedt (the type species) and a new species, *nearctica*, described here.

This genus is very close to *Platycoenosia* but the male parafrontals are narrower and more nearly contiguous, the lower orbital is lacking, the arista is short plumose, and the median sternopleural bristle is strong.

It may be characterized as follows: Head with oral margin not protruding, male with only upper orbital bristle present (distinct head dimorphism). Arista short plumose. Thorax with anterior dorsocentral two-thirds as long as second dorsocentral bristle; three sternopleurals, median one strong. Wing with second anal vein weakly curved forward so as to intersect an extension of first anal vein at or just before margin of wing, costal spine not developed. Abdomen broadest before posterior margin of second segment, that segment in male parallel-sided on apical half, and not half as long as broad, in female distinctly longer than third segment; pollinose, not vittate or maculate. Male hypopygium with no bacilliform process; aedeagus well sclerotized and elongate. Spermathecae two, spherical in shape; duct bases very weakly developed.

Piezura nearctica, new species

Figs. 152, 152A-B

This species is undoubtedly very closely related to the European *graminicola* Zetterstedt, but lacks the hind-tibial anteroventral bristle, and has the third antennal segment yellowish only toward the base. In addition, the tip of the cercal plate is furcate and the dorsal ridge of the surstylus is only weakly developed.

Male

Head.—Frontal bristles five to seven, with a few weaker bristles. Upper orbital bristle present. Parafrontals pale greyish-brown-pollinose, parallel-sided, narrow (0.1 mm.), separated by a distinct (0.2 mm.) black frontal vitta. Parafacial bare. Occipital bristles long, strong, regular. Postoccipital bristles absent. Antenna with first two segments and basal third of third segment yellow; apical portion of third brownish-black; third segment a little over twice as long as broad; arista basally yellowish, short plumose, hairs about two-thirds as long as width of third antennal segment. Palpus and theca yellow; palpus linear; theca short, weakly sclerotized, subpollinose.

Thorax.—Brownish-grey with humerus and margin of scutellum yellowish, with a broad median and two narrow lateral brown vittae. Acr. bristles ir-

regularly quadriserial. Anterior presutural dorsocentral strong, two-thirds as long as second dorsocentral bristle. Accessory setulae moderate in number, short. Pra. one, setulose. Propleuron bare. One strong and one weak stigmatal bristle, no setulae. Mesopleurals rather sparse, not stronger dorsally. Sternopleuron with three bristles, median one about two-thirds as long as anterior bristle. Scutellum with two strong pairs of marginal bristles, a weaker pair of preapical discal bristles, and four or five pairs of basal setulae. Squamae pale yellow, lower distinctly longer and strongly projecting. Haltere yellow. Wing clear, veins yellowish-brown.

Abdomen.—1.6 by 2.7 mm. Integument yellow except for dark lateral margins. Pollen bluish-brown laterally, reduced and whitish discally. Hypopygium moderately projecting.

Legs.—Yellow, only tarsi black. F_1 pvs. strong on apical two-thirds, basally setulose. T_1 with distinct ad. F_2 avs. short, uniserial and rather close together basally, becoming biserial and more crowded apically to form a preapical comb; pvs. longer and stronger, as long as two-thirds femoral diameter preapically, duplicated ventrally by a triserial band of shorter setulae. T_2 weakly enlarged apicad; ventral mat short but dense; one ad., one pd. C_3 with a weak pv. bristle. F_3 avs., ventrals, and pvs. short but stubby, forming a multiserial ventral covering; apical half with several stronger av. and pv. bristles, only one av. distinctly longer (equal to femoral diameter). T_3 with no av., two ads., no strong erect pds.

Hypopygium.—Evenly setulose dorsally, densely setulose at base of surstylus. Cercal plate slender, produced apically and weakly bifurcate. Surstylus broad, base produced strongly toward cercal plate, apically with weak dorsal carina. Ninth sternum broad, basal projections almost meeting medially; aedeagus broad, flat, with a large membranous sheath; postgonites reduced to short stubs. Fifth sternum much broader than long, broadly divided medially, bristles crowded to the posterolateral corners.

Female

Not known.

Type

Holotype.—♂, Bar Harbor, Maine, 22.VII.1919 (no collector) (U.S.N.M. No. 64288).

GENUS *COELOMYIA* HALIDAY

Coelomyia Haliday (in Westwood), 1840, p. 143 (footnote); Schiner, 1862, p. 656; Stein, 1895, p. 133; Meade, 1897, p. 67; Aldrich, 1905, p. 539; Stein, 1907a, p. 665; Schnabl and Dz˙edzicki, 1911, p. 132; Stein, 1913a, p. 25; Stein, 1916, p. 81; Stein, 1919a, pp. 91, 133; Séguy, 1923, p. 258; Karl, 1928, p. 68; Séguy, 1937, p. 176; Ringdahl, 1954a, p. 80; Hennig, 1955, p. 94; Hennig, 1956, p. 97.

Type species.—*Coelomyia mollissima* Haliday (= *spathulata*).

Parmalomyia Bigot, 1882, p. 18 (proposed in synonymy).

This genus contains three species, *mollissima*, *subpellucens*, and *supergressa*, the first two of which are now known to be Holarctic in distribution; the third is Palaearctic. The genus is very similar to the *Fannia serena* group, and shares with it the following characters: lower squama linear; prealar bristles one or two, strong; male hypopygium with apex of cercal plate more or less furcate and surstylus characteristically curved; aedeagus membranous. Exclusive characters of the genus are the projecting oral margin and broadly spatulate abdomen (weakly so in the females).

Hennig (1955) recognized the relationship between *Coelomyia* and *Fannia serena*, and stated that the genus had no more validity than some of the species groups of *Fannia*. However, he continued to give it generic status, and I will also continue use of the name at this time, since I hope in the near future to do a generic revision of the subfamily on a world basis.

The genus may be characterized as follows: Head with oral margin distinctly projecting (weakly so in the females of *subpellucens*), male with no orbital bristles (strong head dimorphism), arista distinctly pubescent. Thorax with both presutural dorsocentrals strong (the first two-thirds as long as the second); two strong sternopleurals. Wing with second anal vein strongly curved so as to intersect an extension of first anal vein well before margin of wing; costal spine not developed. Abdomen broadest at posterior margin of third segment, second segment in male distinctly more than half as long as broad, in female less than half as long as broad, the third segment as long as the second. Abdomen pollinose, distinctly vittate in the males. Abdominal sternites reduced or absent (exclusive character). Male hypopygium with no bacilliform process, aedeagus membranous. Spermathecae two, small and spherical, smooth or weakly corrugated; duct base short, weakly sclerotized.

Immature stages unknown.

For the sake of simplicity, the type species, *mollissima*, will be described in detail, and *subpellucens* compared to it.

Coelomyia mollissima Haliday

Figs. 154, 154A, 220, 269

Coelomyia mollissima Haliday, 1840, p. 143 (footnote); Meade, 1882, p. 224; Meade, 1897, p. 67; Wingate, 1906, p. 268; Kloet and Hincks, 1945, p. 422; Hennig, 1955, p. 95, Figs. 1, 64; syn. *teste* Meade, 1882.

Homalomyia mollissima, Rondani, 1866, p. 129; Rondani, 1877, p. 52; Strobl, 1893, p. 238.

Aricia spathulata Zetterstedt, 1845, p. 1543; Stein, 1895, p. 131; Mik, 1898, p. 172.

Coelomyia spathulata, Aldrich, 1905, p. 539; Stein, 1907a, p. 665; Schnabl and Dziedzicki, 1911, p. 95, Figs. 361, 362, 836; Stein, 1913a, p. 25; Stein, 1915b, p. 136; Frey, 1916, p. 691; Kramer, 1917, p. 71; Séguy, 1923, p. 253, Fig. 499c; Karl, 1928, p. 68, Fig. 40; Ringdahl, 1928, p. 27; Riedel, 1930, p. 79; Lindroth, 1931, p. 325; Audcent, 1932, p. 364; Tiensuu, 1935, p. 43; Karl, 1937, p. 129; Aczél, 1938, p. 173; Ringdahl, 1939, p. 43; Ringdahl, 1944a, p. 17; Ringdahl, 1951, p. 166; Ringdahl, 1952, p. 158; Ringdahl, 1954a, p. 80.

This, the type species of the genus, is easily distinguished from the two other species by the entirely black legs and abdomen, and from *subpellucens* by the distinctly projecting oral margin, and elongate proboscis. In addition, the male has the middle legs much less strongly modified; the apical abdominal segments bear strong ventral brushes of long curled bristles. Length 4.5-5.5 mm.

Male

Head.—Frontal bristles 10 to 14, slender, with numerous interstitials. Parafrontals greyish-brown-pollinose, slender (0.03 increasing to 0.06 mm.), separated by a broad (1.2 mm.) frontal vitta, somewhat constricted medially and strongly broadened above the antennae. Parafacials bare, broad, with the membranous area around the facial plate distinctly evident and reddish in color. Oral margin strongly projecting, genae swollen. Occipital bristles long, slender and irregular; postoccipital bristles present in a double row. Second antennal segment with two strong bristles; third segment small, broad (0.14 by 0.20 mm.); arista unusually short (0.50 mm.), subpubescent. Palpus short, weakly subspatulate apically; theca long and slender (0.12 by 0.60 mm.), pollinose.

Thorax.—Dark-brown-pollinose, not vittate. Acr. bristles triserial, long and slender, median row weaker. Accessory setulae sparse, long and slender; intra-alars biserial, extending laterally onto prealar area. Pra. two, very long and slender, posterior one weaker. Propleuron bare. Stigmatal setulae 10 to 14. Mesopleurals numerous, slender, not stronger dorsally. Scutellum bare except for one row of marginal setulae. Squamae brownish-yellow, haltere yellow, wing clear. Lower squamal lobe linear.

Abdomen.—1.3 by 2.8 mm., strongly spatulate (only 0.9 mm. broad basally), margins curled ventrally. Ventral surface almost entirely membranous, sternites greatly reduced. Entirely black, dark-brownish-pollinose. Median vitta broad and triangulated, but largely obscured by heavy pollen. Marginal bristles of fourth weakly, and of fifth strongly modified into long, curled, and somewhat flattened bristles curving anterodorsally under the abdomen. Hypopygium inconspicuous.

Legs.—Black. F_1 pvs. as a complete row of fine bristles. T_1 with a weak ad. bristle (sometimes absent). F_2 avs. with four or five long strong bristles on basal third, then six shorter closer-set bristles, grading into a strong preapical comb of eight, apical fourth bare; pvs. long, in a single row, strongest medially. T_2 rounded and slender on basal half, then suddenly constricted, and swollen on apical half to twice basal diameter; ventral mat indistinct basally, as long as tibial diameter on swollen portion; one ad., one pd. C_3 bare. F_3 avs. in a full row, increasing from as long as femoral diameter basally to 1.5 times that diameter apically; pvs. as a row of short but strong bristles on basal two-thirds. T_3 with one (rarely two) avs., one ad.

Hypopygium.—Weakly and sparsely bristled. Cercal plate short, tapering toward apex, the apex bifurcate and curving ventrally. Surstylus short, broad, slightly enlarged apically, broadly attached basally. Bacilliform process absent or very weakly developed. Ninth sternum as in most *Fannia* spp., slender, without special processes, with two flap-like postgonites. Fifth sternum as broad as long, moderately indented apically, the bristles scattered evenly over the surface, none strikingly developed.

Female

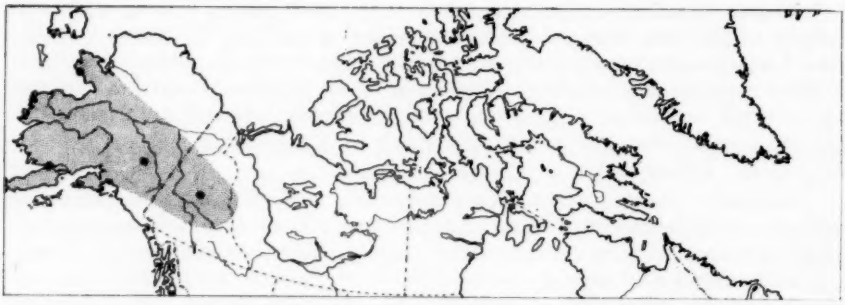
Head.—Parafrontals a little more than one-third as broad as long, frontal bristles fairly strong, setulae usually few in number forming an irregular row. Otherwise as in the male.

Thorax.—Paler, bristled as in the male.

Abdomen.—Uniformly dark-greyish-brown-pollinose. Sterna normally developed.

Legs.—Black, not even the knees yellowish. F_1 pvs. strong on apical two-thirds. F_2 avs. and pvs. with sparse setulae. T_2 with one ad., one pd. C_3 bare. F_3 avs. with four or five strong bristles on apical half, basally setulose; pvs. setulose. T_3 with one av., one ad.

Ovipositor.—Subanal plate short and broad, setulae crowded apically. Cerci normal for the subfamily. Eighth tergum normal, the sternum reduced to a pair of small setulose plates and one small bare basal plate. Seventh segment normal, the sternum about as broad as long. Sixth segment similar to seventh, the sternum a little longer. Spiracles six and seven both in the membrane at the posterior margin of the sixth tergum. Spermathecae two, small, ovoid in shape, smooth-surfaced; duct bases arising from the base, curving only slightly, weakly sclerotized.



Map 60. Geographic distribution of *C. mollissima* Hal.

Type locality and type

Holywood, Ireland. Type location not known.

Type locality of *spathulata*: "Suecica borealis and Lapponica" (northern Sweden and Lapland). Type in Zoologiska Institution, Lund.

Remarks

The species is known in Europe from northern Scandinavia and Ireland south to France and Austria. Also known from the Faroes and Iceland.

In this country, it is known only from Alaska, Northwest Territories, and the Yukon.

Records, 19 ♂♂, 15 ♀♀ (Map 60)

ALASKA. Nome, 6 ♂♂, 2 ♀♀; King Salmon, Naknek R., 1 ♂; Hurricane, 3 ♂♂, 9 ♀♀; Healy, 2 ♂♂; Savonoski, Naknek L., 1 ♂; Kotzebue, 3 ♀♀; Camp 334, Alsk. Eng. Comm., 1 ♀; Mile 213, Richardson Hwy., 5 ♂♂. YUKON. Haggard Creek, 1 ♀. NORTHWEST TERRITORIES. Aklavik, 1 ♂, 1 ♀.

Collecting dates from June 17 to July 29.

I have also examined a few specimens from Sweden and Lapland.

Coelomyia subpellucens (Zetterstedt)

Figs. 153, 153A, 221, 250, 270

Aricia subpellucens Zetterstedt, 1845, p. 1561.
Homalomyia subpellucens, Meunier, 1893, p. 62.
Coelomyia subpellucens, Stein, 1895, p. 134; Stein, 1904, p. 458; Stein, 1907a, p. 666; Schnabl and Dziedzicki, 1911, p. 132; Stein, 1913a, p. 25; Stein, 1916, p. 81; Stein, 1919a, p. 133; Stein, 1920, p. 45; Ringdahl, 1928, p. 27; Ringdahl, 1930, p. 4; Stackelberg, 1933, p. 528; Tiensuu, 1935, p. 43; Ringdahl, 1939, p. 43; Ringdahl, 1951, p. 166; Ringdahl, 1952, p. 158; Ringdahl, 1954a, p. 80; Hennig, 1955, p. 96, Figs. 2, 65; Hennig, 1956, p. 97, Text Fig. 20.
Anthomyza canicularis Zetterstedt, 1838, p. 681 (nec Linné), var. b ♀; syn. *teste* Zetterstedt, 1845.
Homalomyia flavivaria Coquillet, 1900, p. 446; syn. *teste* Malloch, 1913, p. 631.

This species is easily recognized from *mollissima* by the scarcely protruding oral margin and shorter, plumper proboscis; and from *supergressa* by the single prealar bristle and wider frons. In the male, the mid legs are strongly modified with strong heavy medial spines on the femora; the abdomen is frequently yellowish basally, and its apical segments are not armed with many strong ventral bristles. Length 4.5-6.0 mm.

Differs from *mollissima* as follows:

Male

Head.—Frontal bristles eight to 10, slender with a few short interstitials. Parafrontals dull-silvery-pollinose, broader, increasing from 0.02 to 0.10 mm., the frontal vitta usually less than 0.06 mm. wide medially. Membranous area around facial plate not distinct. Oral margin scarcely projecting, genae normal. Second antennal segment with only one strong bristle, third segment more elongate (0.15 by 0.30 mm.), arista 0.60 mm. long. Theca broader and shorter, 0.20 by 0.50 mm.

Thorax.—Accessory setulae sparse and short, intraalars uniserial, not extended laterally. Stigmatal setulae about six. Squamae yellowish-white.

Abdomen.—2.0 by 3.6 mm., margins not strongly curved ventrally, but lateral margins of fifth produced medially as a large rounded tubercle. Lateral areas of second to fourth segments normally pellucid yellow, but sometimes only second or third distinctly yellow, remainder black, thinly dark-brown-pollinose (greyish in the paler specimens). Median vitta not distinguishable except on those segments which are largely yellow. Marginal bristles not strongly developed. Hypopygium larger, but still inconspicuous.

Legs.—Black, or with the tibiae and hind femur yellowish. F_1 pvs. weak and reduced on basal half. F_2 (see Fig. 250) with strongly differentiated bristling; avs. with two strong thorn-like bristles at one-fourth, then six more slender but equally long bristles to one-half, a break, and a clump of six short bristles, a long break, and six weak preapicals; pvs. with about eight long slender bristles on basal half, then a clump of about six slightly shorter, a long break, and a few weak preapicals. T_2 with a subbasal swelling, a constriction, then sharply swelling again and continued to apex at about twice basal diameter; ventral mat evident only on apical fourth. F_3 avs. of equal length throughout, or becoming slightly smaller apicad; pvs. represented by only scattered setulae basally with a row of setulae on apical third. T_3 with one or two avs. (fairly frequently two).

Hypopygium.—Larger, more strongly and densely bristled. Surstylus more distinctly broadened apically. Fifth sternum reduced to two broad lateral plates, bristles scattered evenly over both membrane and plates.

Female

Head.—As described for *mollissima*, separated from it by less produced oral margin and broader, shorter theca as in the male.

Thorax.—Separated from *mollissima* by the more restricted intraalars and reduced (usually only two to eight) stigmatal setulae.

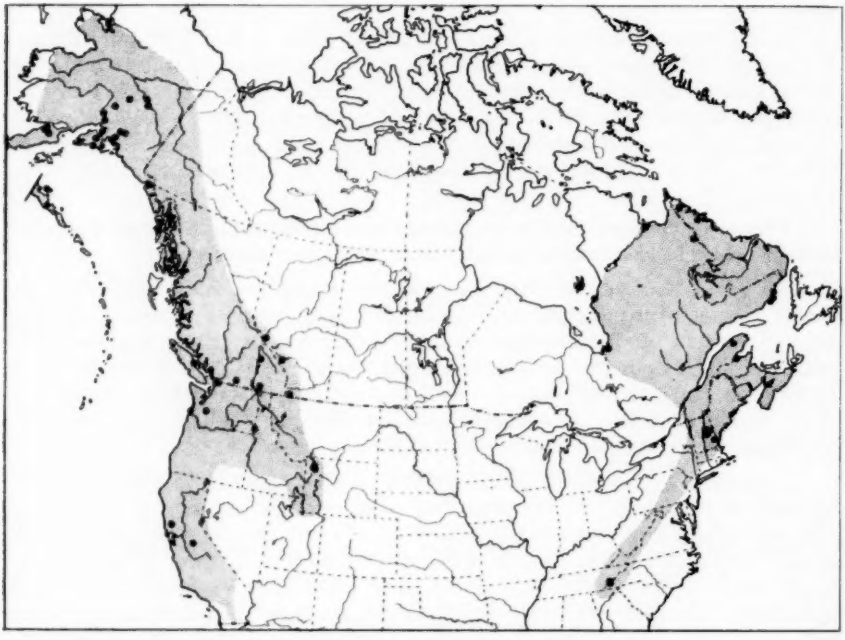
Abdomen.—Normally largely pellucid-yellow, posterior margins bluish-brown. Sometimes entirely dark.

Legs.—Black, usually with at least tibiae yellowish. F_1 pvs. strong at most on apical half. F_2 avs. with two to four distinct bristles on median area, basally and apically setulose.

Ovipositor.—Subanal plate more elongate, the setulae more scattered. No basal plate present in the eighth sternites. Spiracles not crowded together, the seventh in the membrane at the posterior margin of the sixth tergum.

Type

"Scandinavia boreali" (Northern Scandinavia). Type in Zoologiska Institution, Lund.



Map 61. Geographic distribution of *C. subpellucens* (Zett.).

Type locality of *flavivaria*: Yakutat, Alaska. Type series in U.S. National Museum, No. 5246, examined by me in February, 1955.

Remarks

The species is known in Europe only from Scandinavia. On this continent it is known from Alaska south along the mountains to California and from Labrador south to Tennessee, with no records from the central states and provinces.

Records, 161 ♂♂, 202 ♀♀ (Map 61)

ALASKA. Sitka, 2 ♂♂, 7 ♀♀; Virgins Bay, 2 ♂♂, 4 ♀♀; Yakutat, (1 ♂ type) 3 ♂♂, 1 ♀; Metlakahtha, 1 ♂, 1 ♀; Kukak Bay, 2 ♀♀; Berg Bay, 2 ♂♂; Hurricane, 10 ♂♂, 6 ♀♀; Camp 327, Alsk. Eng. Comm., 3 ♂♂, 2 ♀♀; Camp 334, 1 ♂, 5 ♀♀; Healy, 2 ♂♂; Juneau, 1 ♂; Dead Horse, 2 ♂♂; Palmer, 1 ♀; Fairbanks, 1 ♀; Fox, 1 ♀; Kotzebue, 1 ♂; Fire Lake, 1 ♀; 25 Mi. E. of Willow, 6 ♀♀; Popoff Island, 3 ♂♂, 2 ♀♀; Seward, 2 ♂♂, 9 ♀♀; Fort Richardson, 3 ♀♀; Anchorage, 1 ♀; Valdez, 1 ♀; Valdez-Fairbanks Mile Post 23, 1 ♂, 1 ♀; Naknek (on tundra), 27 ♂♂, 29 ♀♀; King Salmon, Naknek R., 11 ♂♂, 19 ♀♀; Curry, 2 ♂♂; Cold Bay (163° W.) (on tundra), 1 ♂, 5 ♀♀; Mile 315, Richardson Hwy., 1 ♂, 1 ♀. NORTHWEST TERRITORIES. Aklavik, 1 ♂. BRITISH COLUMBIA. Hedley, 6 ♂♂, 14 ♀♀; Qualicum Bay, 1 ♀; Mt. Revelstoke, 1 ♂, 1 ♀; Robson, 2 ♀♀; Miracle Beach, nr. Oyster R., 1 ♀; Squamish, Diamond Head Trail (4600 ft.), 1 ♂; Yoho, 1 ♀; Hector, 1 ♂, 1 ♀; Moresby Camp, Q.C.Is., 5 ♂♂, 6 ♀♀; Massett, Q.C.Is., 5 ♀♀. ALBERTA. Waterton Lakes, 1 ♂, 1 ♀; Banff, 1 ♂, 1 ♀; Mt. Edith Cavell, Jasper National Park, 1 ♀.

WASHINGTON. Ilwaco, 12 ♂♂; Mt. Rainier, 3 ♂♂; Glacier, 2 ♂♂. IDAHO. Moscow Mt., 2 ♂♂. WYOMING. Yellowstone Nat. Park (Sylvan Pass), 6 ♀♀; Lake Junction, 4 ♀♀. CALIFORNIA. Merced Lake, 1 ♀; Mesa Grande, Sonoma Co., 2 ♀♀. LABRADOR. Tessiujak Lake, Nagvak Fjord, 1 ♀; Nutak, 1 ♀. QUEBEC. Fort Chimo, 1 ♂, 2 ♀♀; Great Whale R., 7 ♂♂; Mistassini Post, 1 ♀; Indian House Lake, 8 ♂♂, 13 ♀♀; Mt. Albert, 1 ♀; Little Mecatina Is., 1 ♂, 2 ♀♀; Mutton Bay, 1 ♂, 4 ♀♀; Tobatiére, 1 ♂, 8 ♀♀; Bonne Esperance, 1 ♀. NEW BRUNSWICK. Campbellton, 2 ♂♂. NEW HAMPSHIRE. White Mts., 4 ♂♂, 5 ♀♀; Glen House, 1 ♂; Bretton Woods, 2 ♂♂; Rochester, 1 ♂; Valley Way, 7 ♂♂; Halfway House, Mt. Washington, 2 ♂♂; Mt. Washington, 7 ♂♂, 1 ♀; Franconia, 2 ♀♀; Kinsman Notch, 1 ♂; Mt. Greylock, 2 ♀♀. MARYLAND. Bowie (D.D.T. Expt.), 1 ♀. NORTH CAROLINA. Forney Ridge, Andrews Bald, G.S.M.N.P., 3 ♂♂. TENNESSEE. Smoky Mts. (6000 ft.), 1 ♂.

Collecting dates from May 16 to August 23.

Acknowledgments

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To Dr. H. C. Huckett I wish to express my gratitude for his generosity and cooperation in allowing me to examine his excellently sorted collection of Fanniinae, and in assisting me in the resolving of several taxonomic problems.

I wish also to acknowledge my indebtedness to Dr. C. D. Michener, Dr. G. W. Byers, Dr. H. B. Hungerford, and my colleagues of the Insect Systematics Unit, Science Service, Ottawa, for their many useful suggestions and advice during the preparation of the manuscript.

I wish also to thank my wife Naomi for her assistance on the paper and for her patience with the author during the course of this work.

Addenda

Notes on the Fanniinae of Central British Columbia

During the summer of 1960, an insect survey party from the Entomology Research Institute collected from late May to mid August in central British Columbia in the vicinity of Terrace. The following records are based on this material.

Fannia

scalaris group

F. scalaris. 2 ♂♂, 6 ♀♀, from window of cow shed, Terrace; 1 ♂, 1 ♀, Terrace (around house). June and July.

F. atripes. 1 ♂, on flowers of *Heracleum lanatum*, 32 mi. W. of Terrace.

F. ciliatissima. Several specimens (see footnote under that species).

F. columbiana. 7 ♂♂, 8 ♀♀, listed as paratypes in a footnote to the description. Almost all specimens were collected from umbelliferous flower heads in June and July.

F. enotahensis. 13 ♂♂, 1 intersex. Generally distributed in the area, at altitudes from 300-4200 ft., throughout the season.

***F. manicata* group.** 18 ♀ ♀, probably both *ciliatissima* and *enotahensis*, of which the females are inseparable.

F. fuscula. 21 ♂ ♂, 8 ♀ ♀. Common throughout June and July from Terrace to Prince Rupert. Specimens were attracted to and reared on a squirrel carcass.

mutica group

F. mutica. 5 ♂ ♂, 1 ♀, Terrace and Prince Rupert. Males in early June, female in early August.

F. immutica. 1 ♂, Mt. Thornhill (3500 ft.), August 8.

lugubrina group

F. falcata. 1 ♀, 33 mi. W. of Terrace, July 13.

birticeps group

F. lasiops. 1 ♀, Kleanza Creek, 14 mi. E. of Terrace, June 30.

postica group

F. postica. 1 ♂, 2 ♀ ♀, Terrace. June 16-August 2.

F. brevicauda. 3 ♂ ♂, 3 ♀ ♀. In vicinity of Terrace from 250-4500 ft.

F. enigmata. 1 ♂, Terrace, July 17.

F. flavibasis. 23 ♂ ♂, 115 ♀ ♀, 1 intersex. Common, abundant at low altitudes, and extending up to 3500 ft. on the mountains. June 17 to mid August, most abundant in late July.

F. spathiophora. 2 ♂ ♂, 140 ♀ ♀, one intersex. Abundant in low wet areas around Terrace throughout late June and early July, rare in late July. Note that the sex ratio is similar to that in the east, and quite unlike that in Alaska.

F. aethiops. 3 ♂ ♂, 40 ♀ ♀. Collected only in wet clearings at low elevation during June and early July.

carbonaria group

F. melanura. 1 ♀, Terrace, July 9.

F. corvina. 1 ♂, 6 ♀ ♀, at low elevation around Terrace, June and July.

F. fuscitibia. 1 ♀, Kleanza Creek, 14 mi, E. of Terrace, June 29.

F. brevipalpis. 1 ♂, 10 ♀ ♀, 32 mi. W. of Terrace, June and July.

F. neopolychaeta. 1 ♂, 1 ♀, Terrace, May 31.

kowarzi group

F. kowarzi. 8 ♂ ♂, 5 ♀ ♀, low elevations around Terrace, June and early July. One male was collected from flower heads of *Heracleum lanatum.*

pretiosa group

F. depressa. 1 ♂, Shames, 18 mi. W. of Terrace, July 17.

serena group

F. serena. 70 ♂ ♂, 65 ♀ ♀, at low elevations from the Pacific coast to 60 mi. east of Terrace, June and July. Several specimens, both male and female, from umbellifer flower heads in early June.

F. intermedia. 28 ♂ ♂, 5 ♀ ♀, from Terrace to 32 mi. W. of Terrace, almost all collected in early June from flower heads of *Heracleum lanatum.* The occurrence of this species along with *serena* further validates the distinctness of

this species. There are, however, indications that some hybridization is present, as in the eastern *meridionalis* and *immaculata*. A detailed study was not possible before publication time.

F. immaculata. 5 ♂♂, 4 ♀♀, from vicinity of Terrace, mid June. This is an important range extension, see Map. 38.

F. sociella. 55 ♂♂, 45 ♀♀, at low elevations from the Pacific Coast to 14 mi. E. of Terrace. Mid June to mid August. Numerous males taken in early July swarming at a height of 8-15 feet along a path at the edge of a clearing.

F. ochrogaster. 10 ♂♂, 9 ♀♀, from vicinity of Terrace and at Queen Charlotte City, Queen Charlotte Islands. These are significant range extensions for this species.

F. aerea. 15 ♂♂, 70 ♀♀. From 14 mi. E. Terrace to the Pacific coast, and on Queen Charlotte Islands. Early June to mid August, at elevations from sea level to 3500 ft. A few specimens were attracted to a dead rabbit carcass, but most were collected along with *spathiophora* and *flavibasis* in open moist clearings. In August, it becomes the commonest species of *Fannia* in the area.

canicularis group

F. canicularis. Numerous specimens in outbuildings, garages and houses. Frequently mistaken for the house fly by local populace. It swarms in considerable numbers in the airport buildings. Also found in lesser numbers away from human habitation throughout central British Columbia.

F. subpubescens. 1 ♂, Slickenslide Creek, 49 mi. W. of Terrace, July 9.

F. morrisoni. 1 ♀, Kitwanga Ferry, July 1.

Coelomyia

C. subpellucens. Numerous specimens. Very common throughout the season, and present throughout the area at elevations from sea level to above treeline (4500 ft.). Most common in the early part of the season, when it was taken on the flowers of many species of plants.

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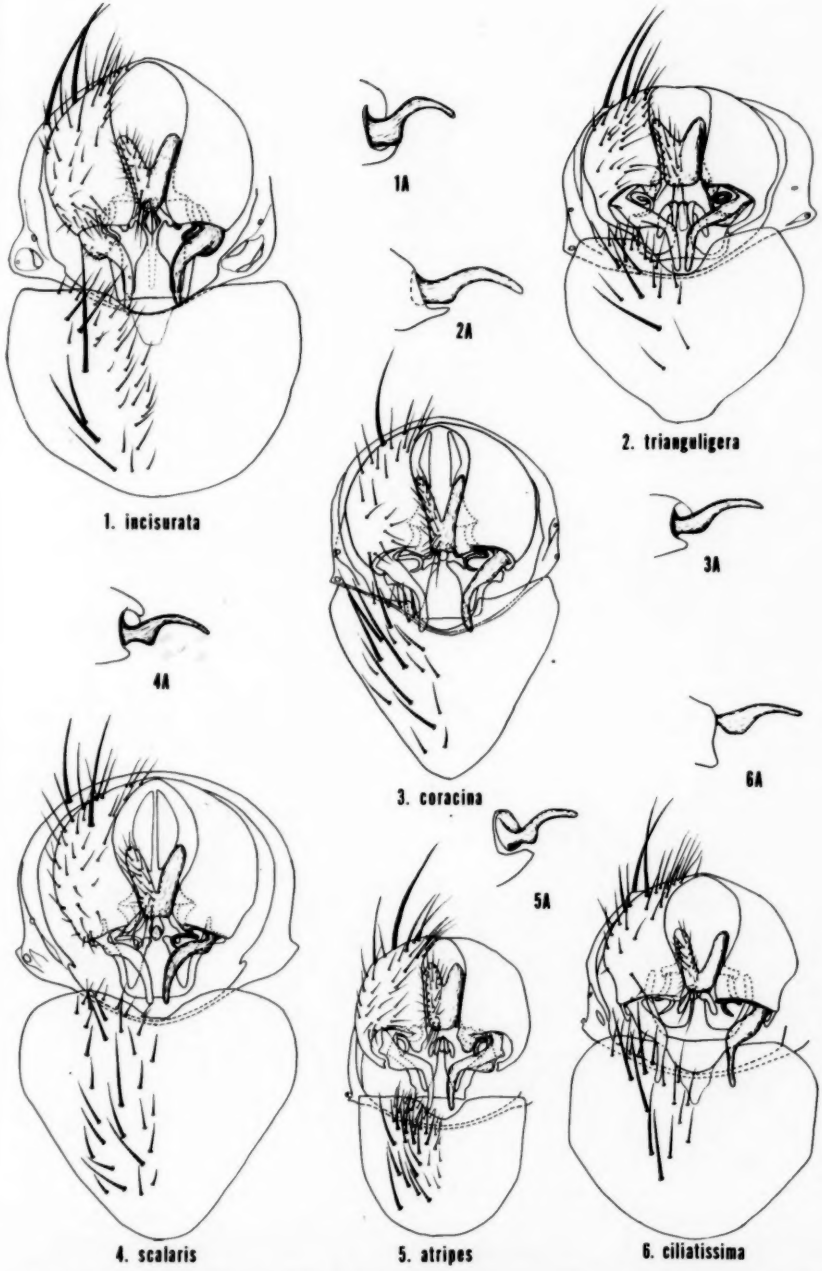
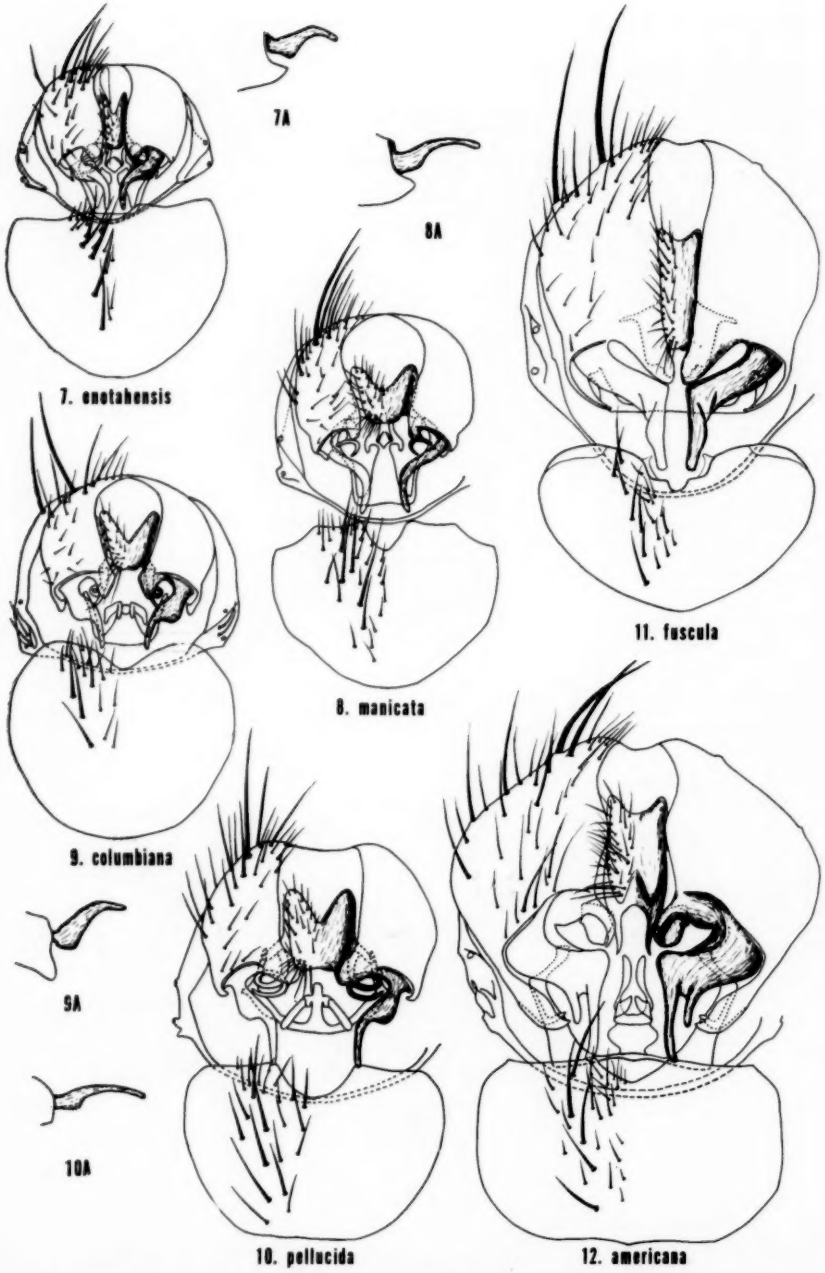
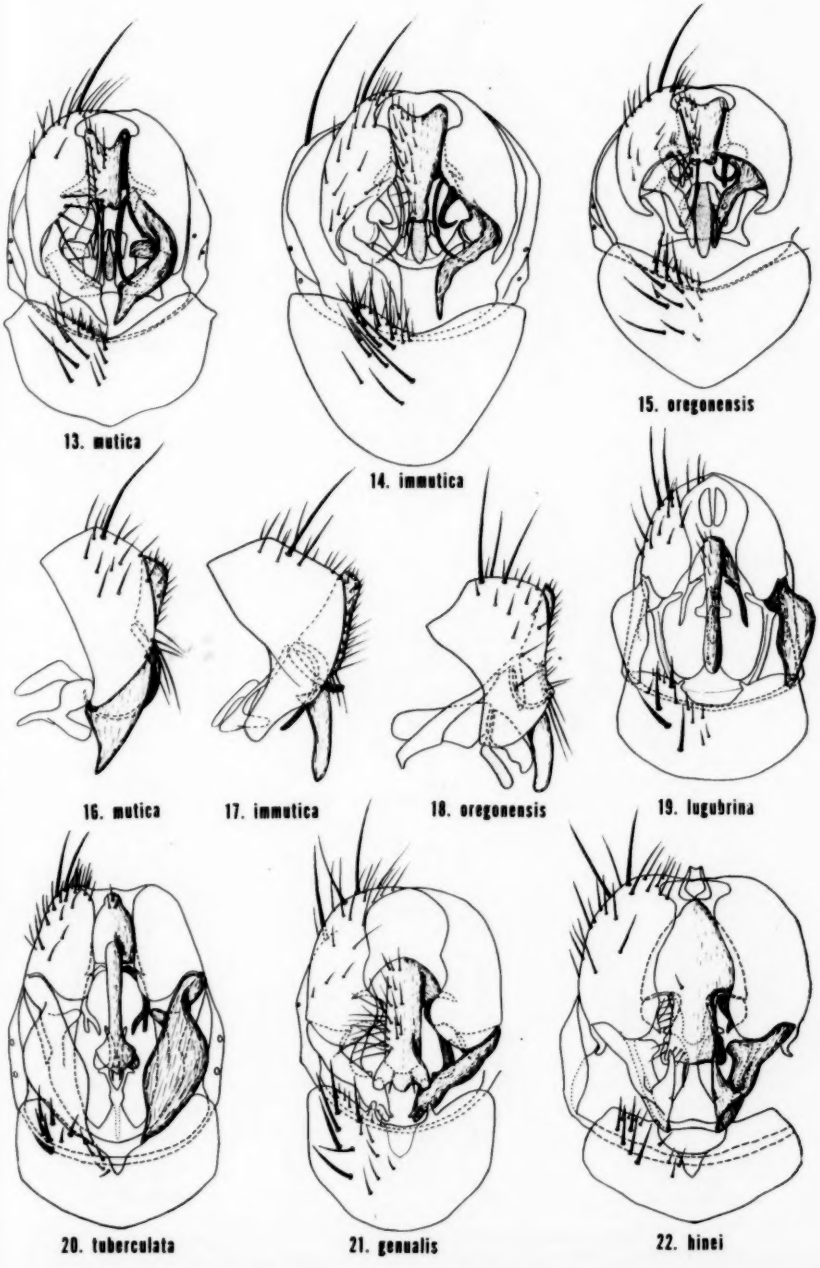


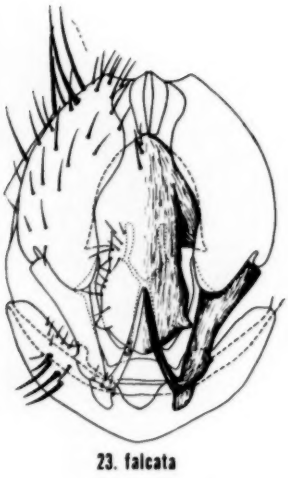
Figs. 1-6. Hypopygia of *Fannia* spp. 1-6. Posteroventral views of hypopygia and adjacent sclerites. 1A-6A. Lateral views of surstyli.



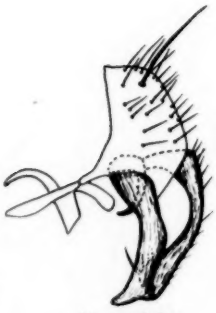
Figs. 7-12. Hypopygia of *Fannia* spp. 7-12. Posteroventral views of hypopygia and adjacent sclerites. 7A-12A. Lateral views of surstyli.



Figs. 13-22. Hypopygia of *Fannia* spp. 13-15, 19-22. Posteroventral views of hypopygia and adjacent sclerites. 16-18. Lateral views of hypopygia.

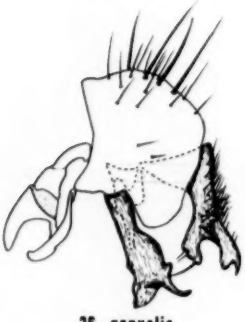


23. falcata

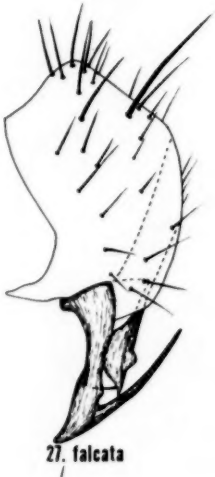


24. lugubrina

25. tuberculata

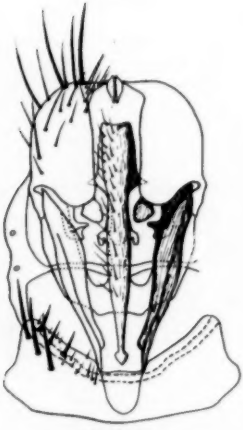


26. genualis

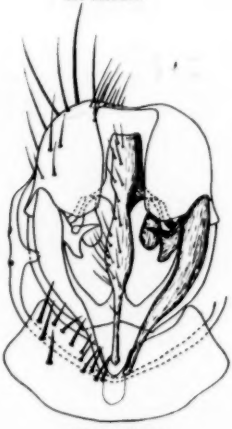


27. falcata

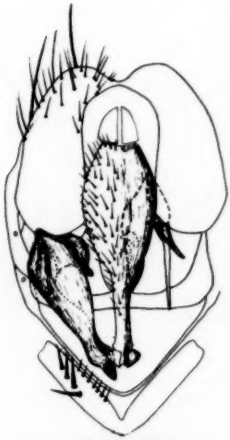
28. hinei



29. lasiops

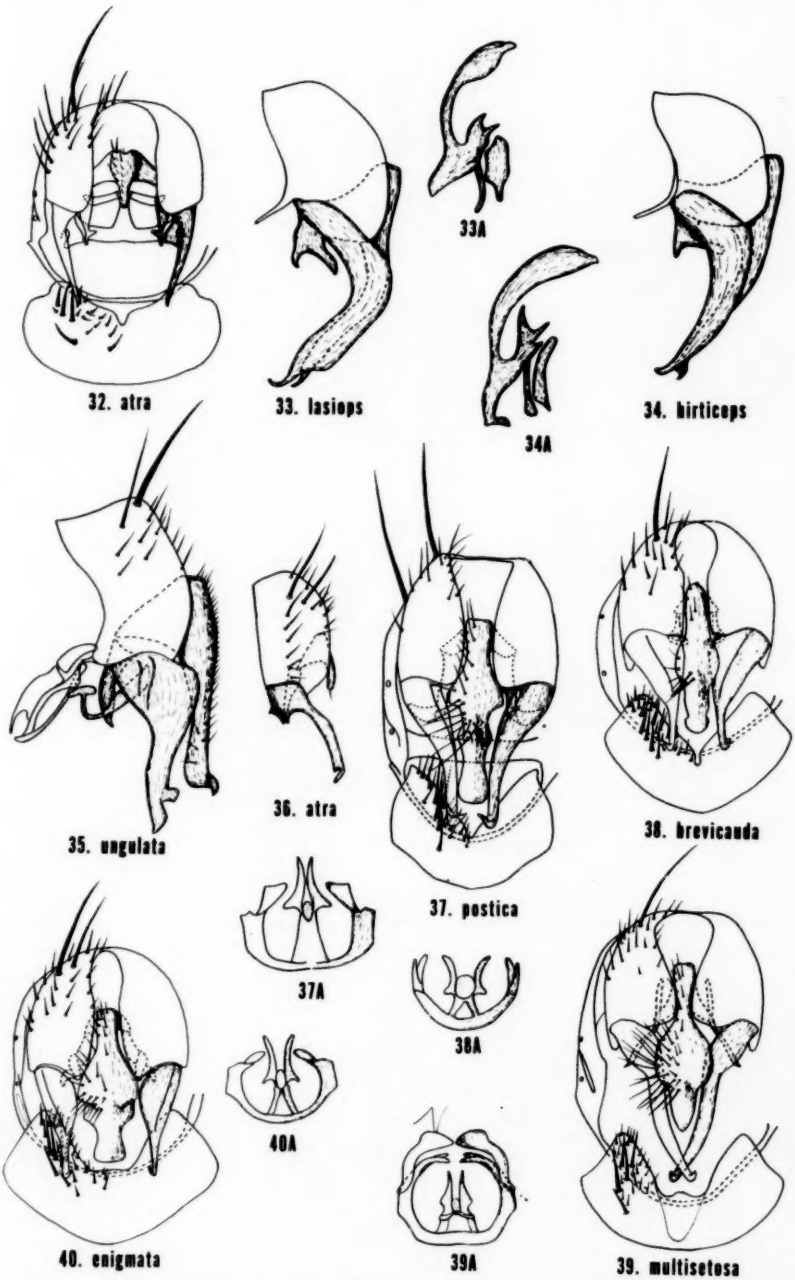


30. hirticeps

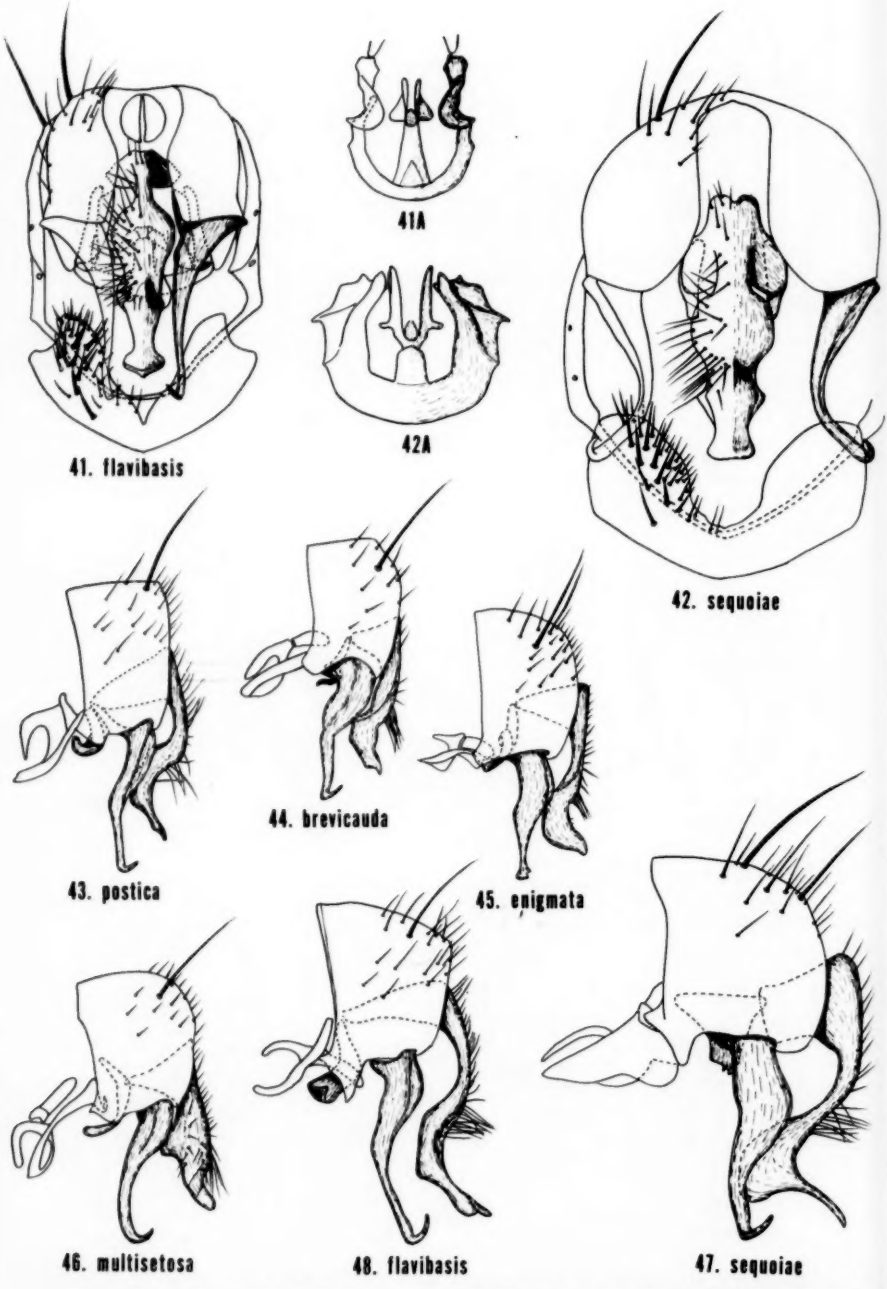


31. ungulata

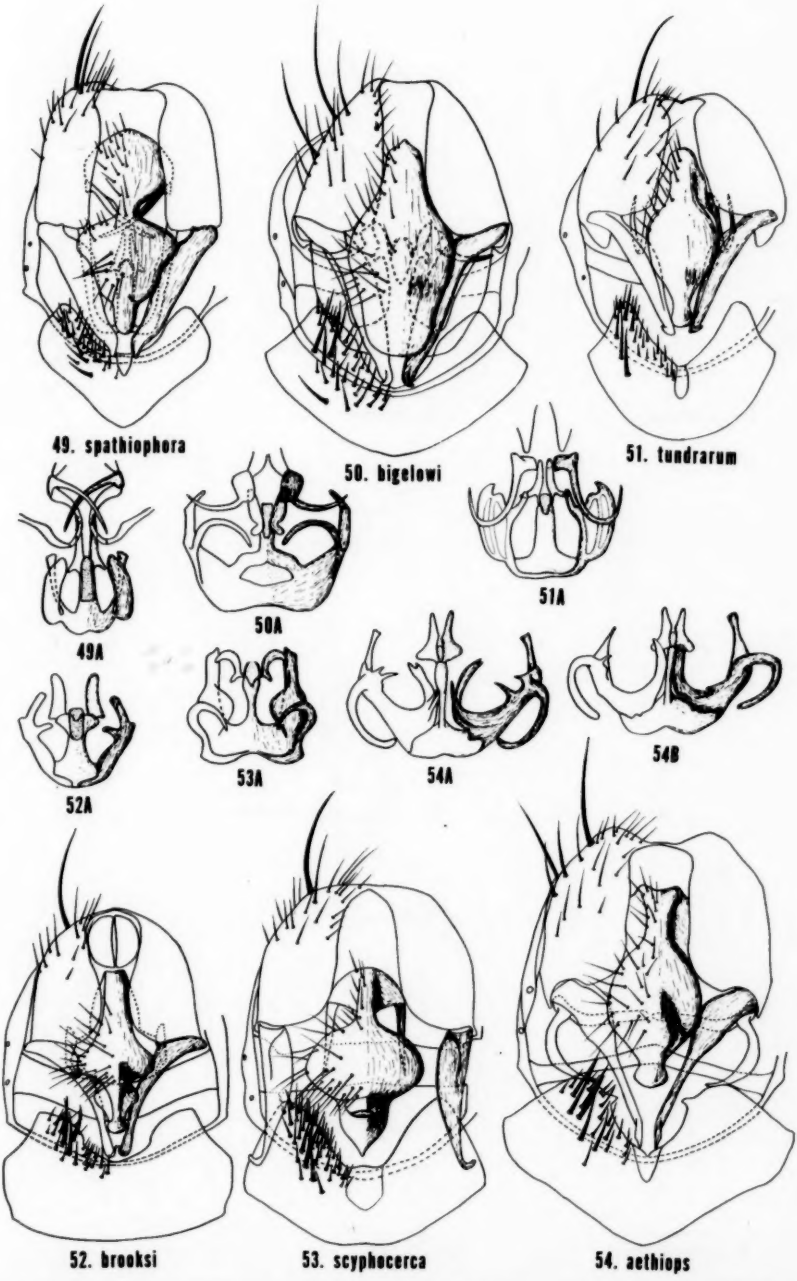
Figs. 23-31. Hypopygia of *Fannia* spp. 23, 29-31. Posteroventral views of hypopygia and adjacent sclerites. 24-28. Lateral views of hypopygia.



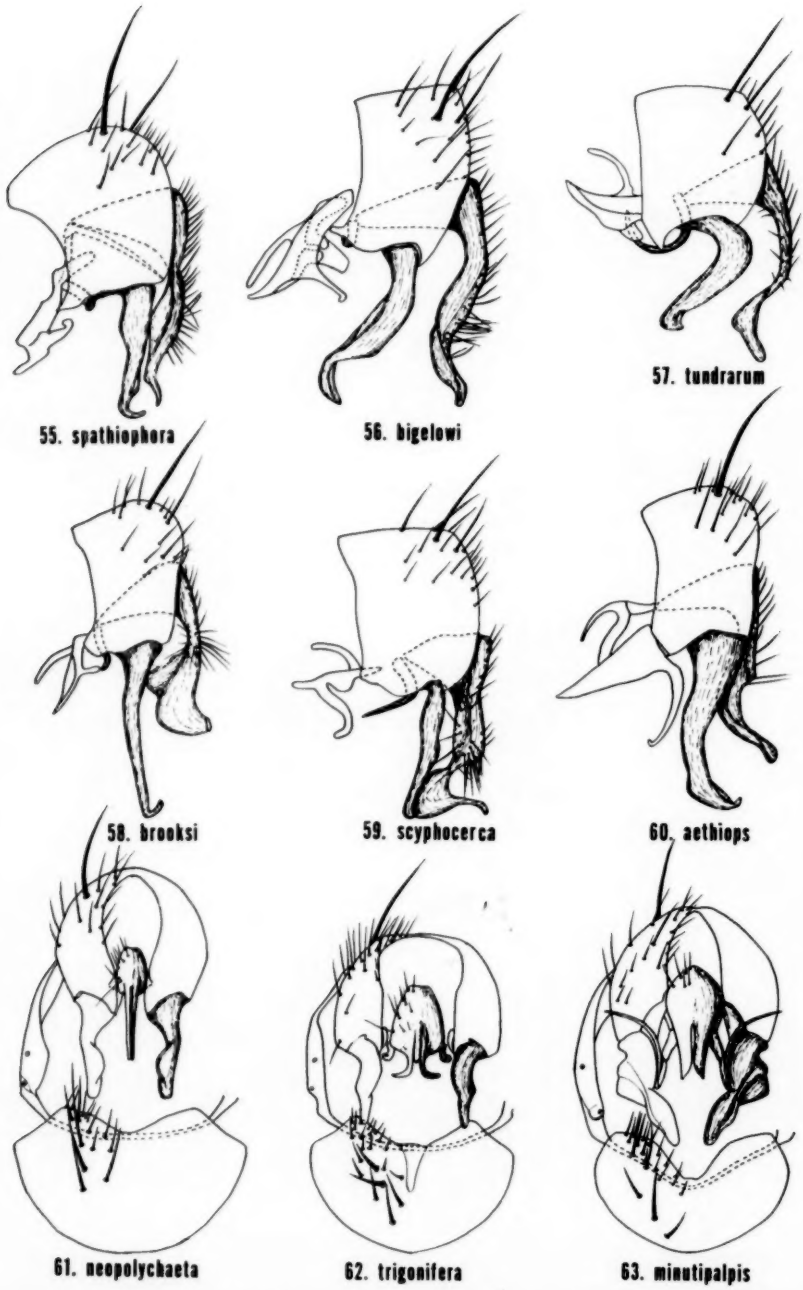
Figs. 32-40. Hypopygia of *Fannia* spp. 32, 37-40. Posteroventral views of hypopygia and adjacent sclerites. 33-36. Lateral views of hypopygia. 33A, 34A. Ventral views of surstyli and bacilliform processes. 37A-40A. Ventral views of ninth sterna (and associated structures).



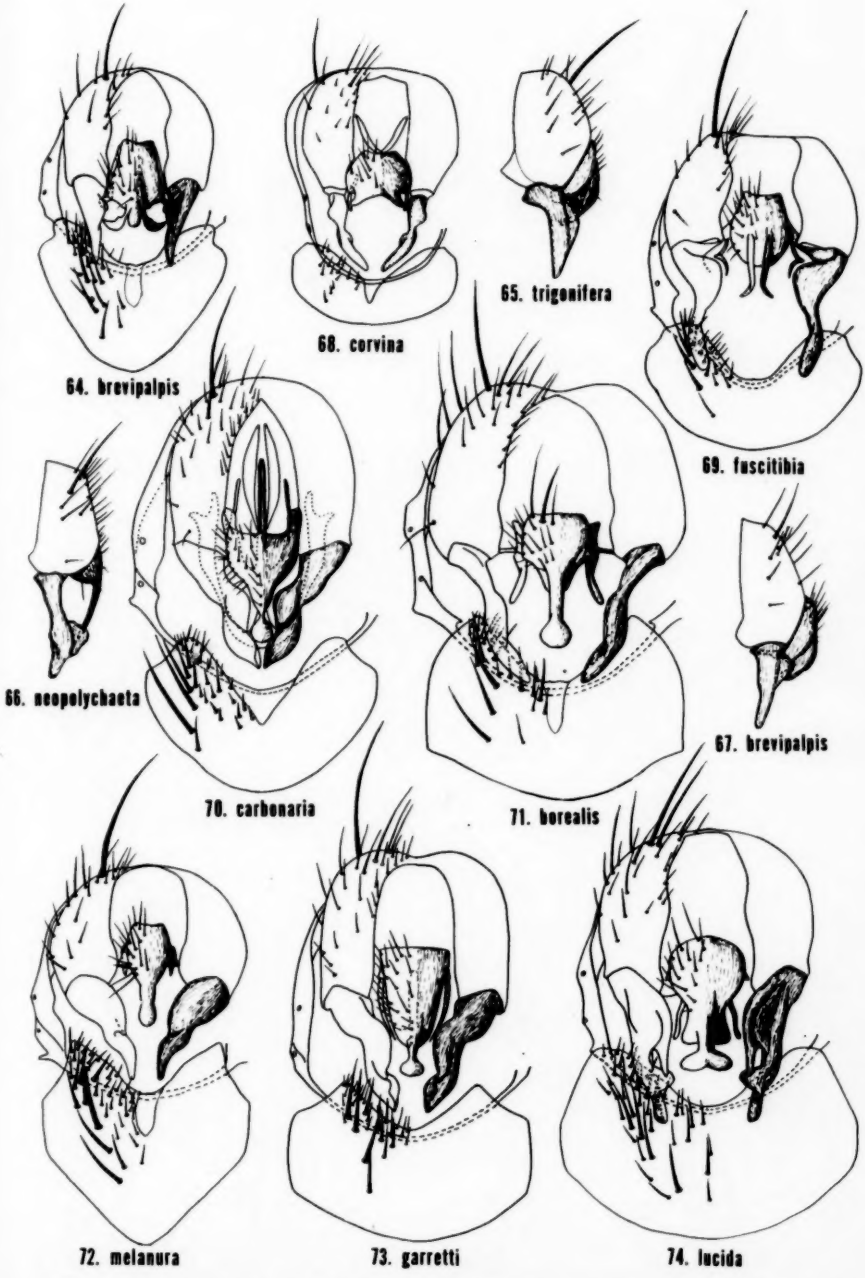
Figs. 41-48. Hypopygia of *Fannia* spp. 41-42. Posteroventral views of hypopygia and adjacent sclerites. 41A-42A. Ventral views of ninth sterna (and associated structures). 43-48. Lateral views of hypopygia.



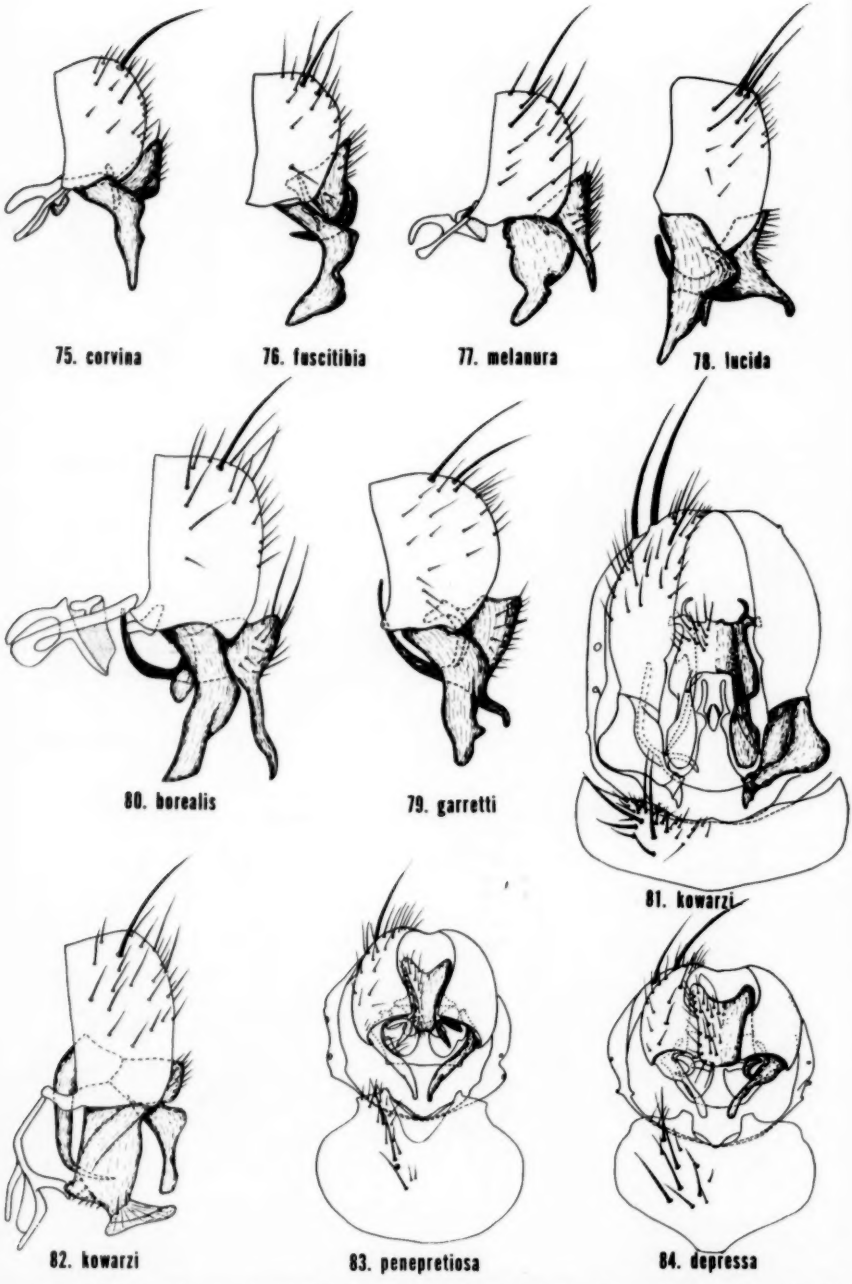
Figs. 49-54. Hypopygia of *Fannia* spp. 49-54. Posteroventral views of hypopygia and adjacent sclerites. 49A-54A, 54B. Ventral views of ninth sterna (and associated structures).



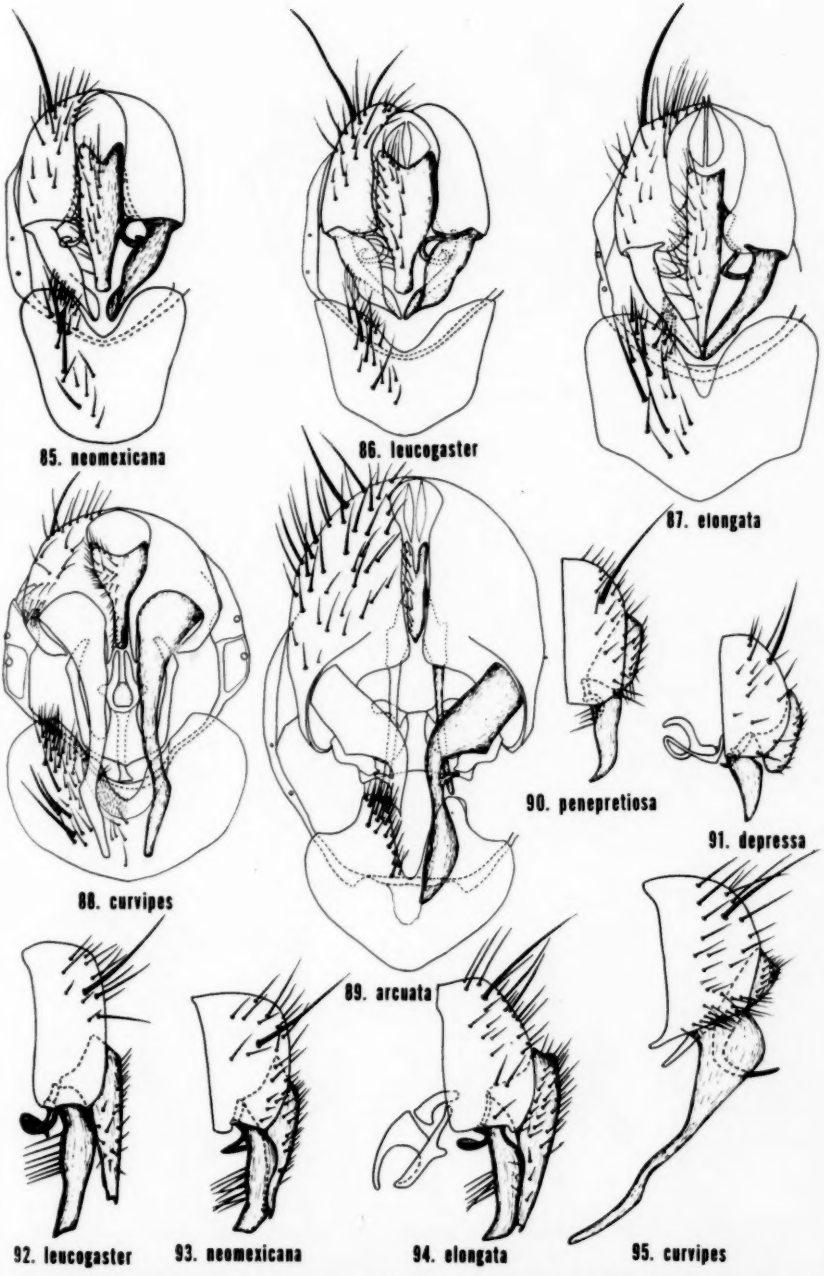
Figs. 55-63. Hypopygia of *Fannia* spp. 55-60. Lateral views of hypopygia. 61-63. Posteroventral views of hypopygia and adjacent sclerites.



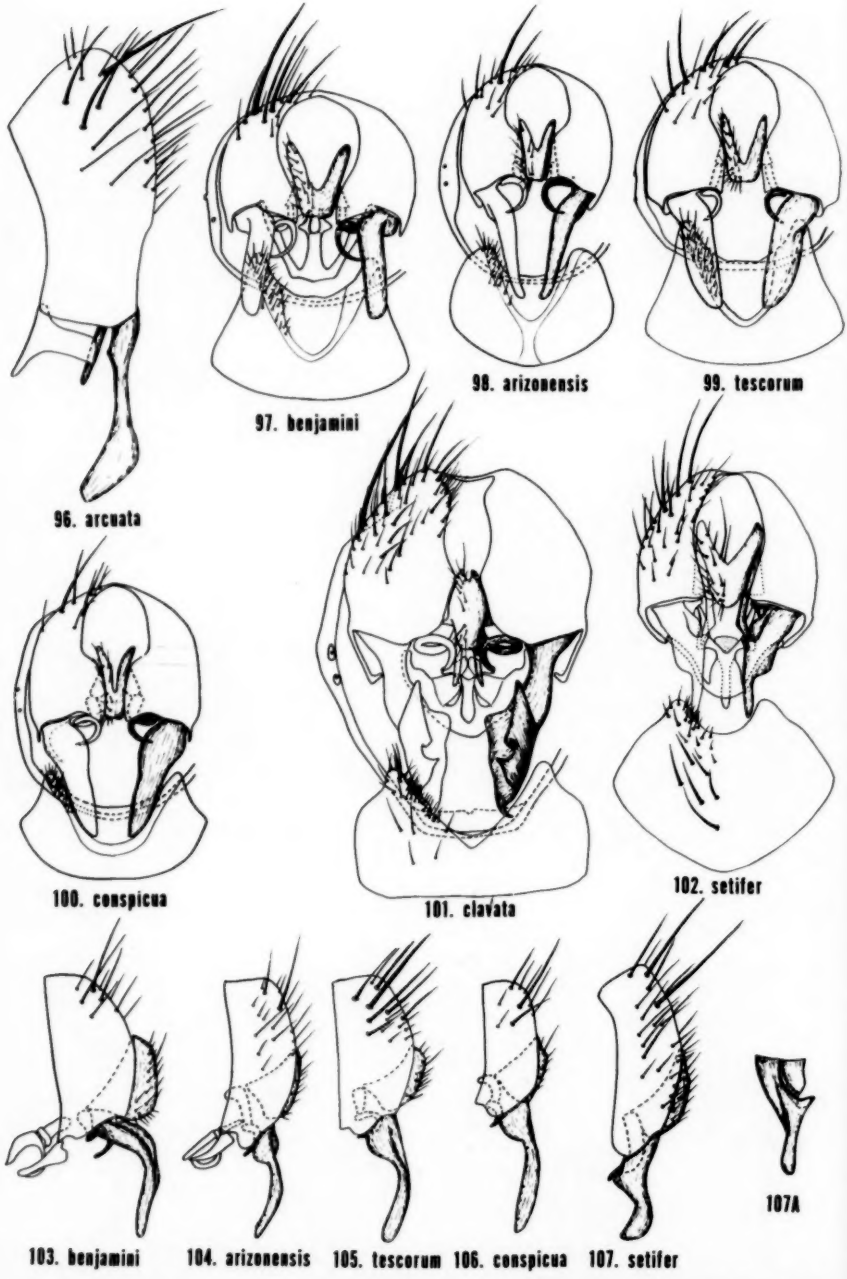
Figs. 64-74. Hypopygia of *Fannia* spp. 64, 68-74. Posteroventral views of hypopygia and adjacent sclerites. 65-67. Lateral views of hypopygia.



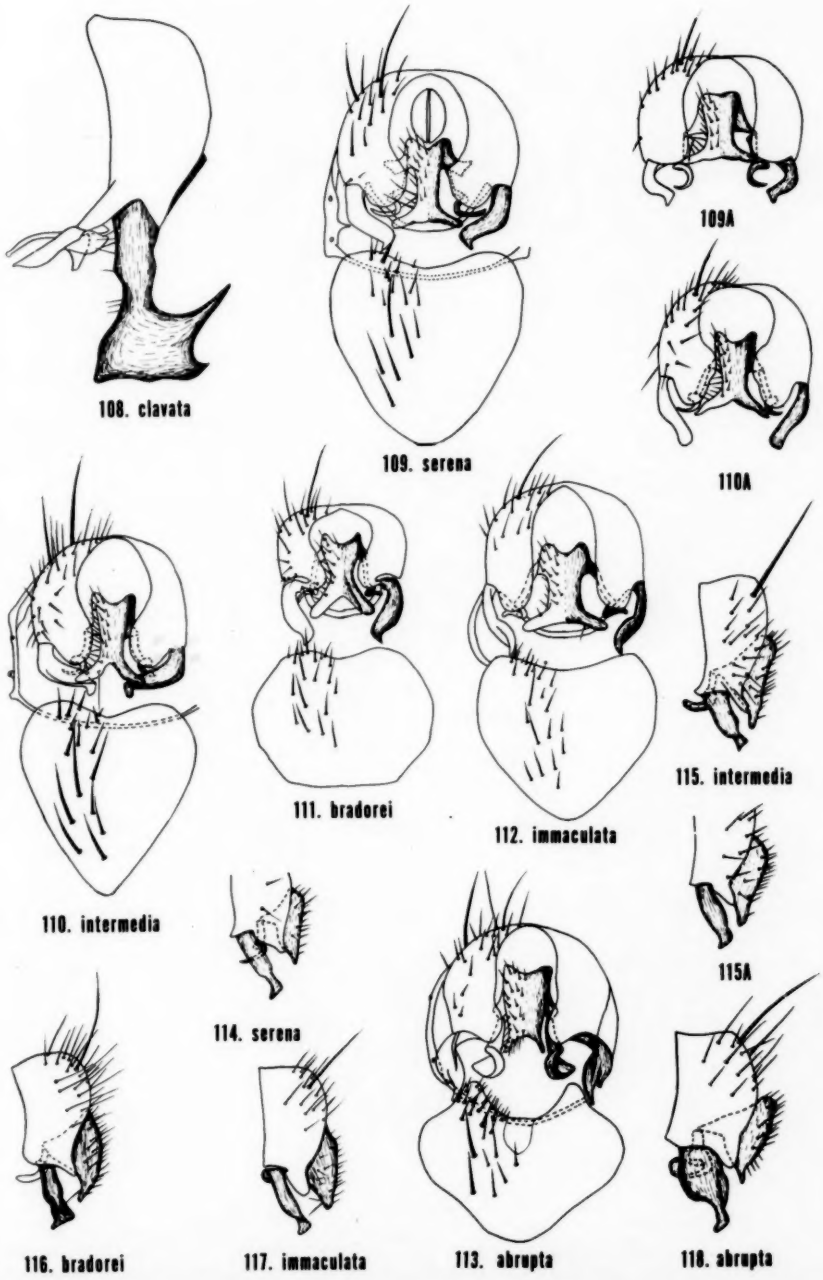
Figs. 75-84. Hypopygia of *Fannia* spp. 75-80, 82. Lateral views of hypopygia. 81, 83, 84. Posteroventral views of hypopygia and adjacent sclerites.



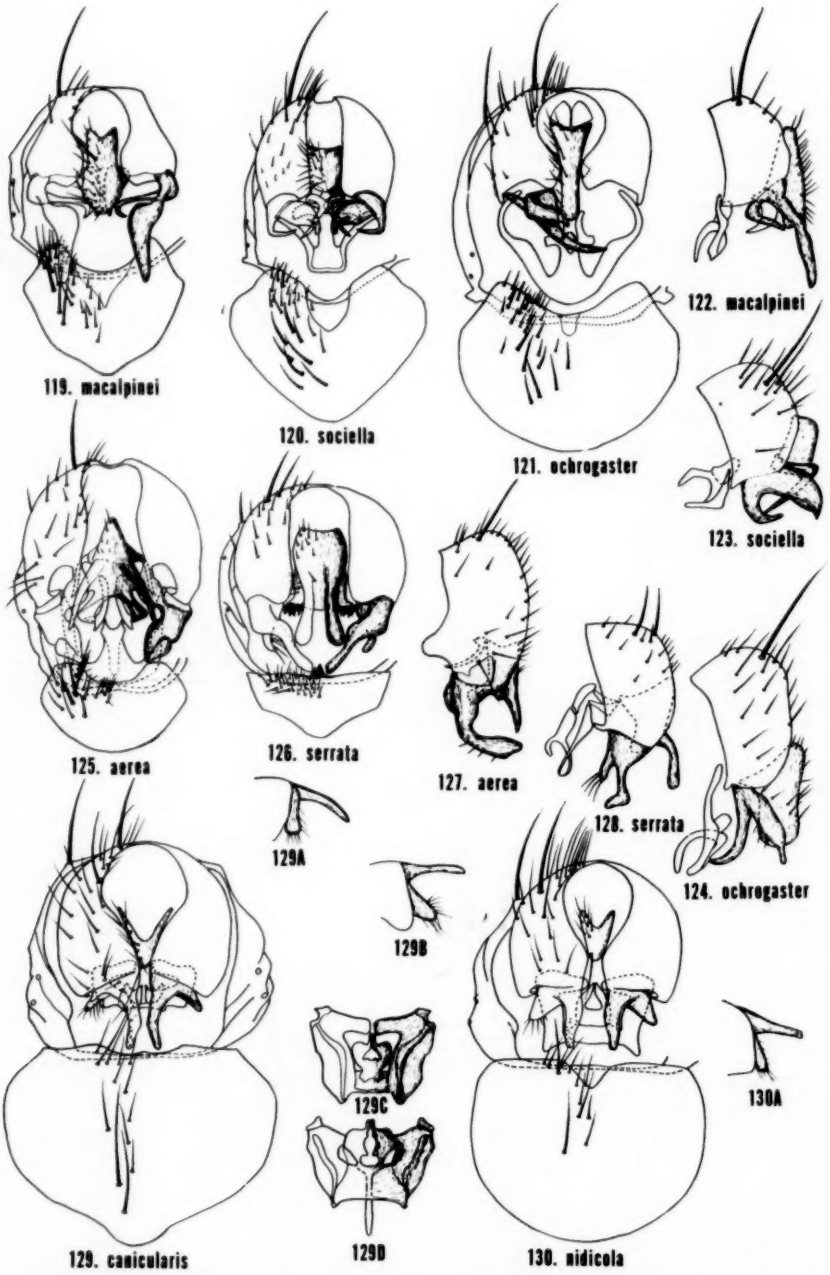
Figs. 85-95. Hypopygia of *Fannia* spp. 85-89. Posteroventral views of hypopygia and adjacent sclerites. 90-95. Lateral views of hypopygia.



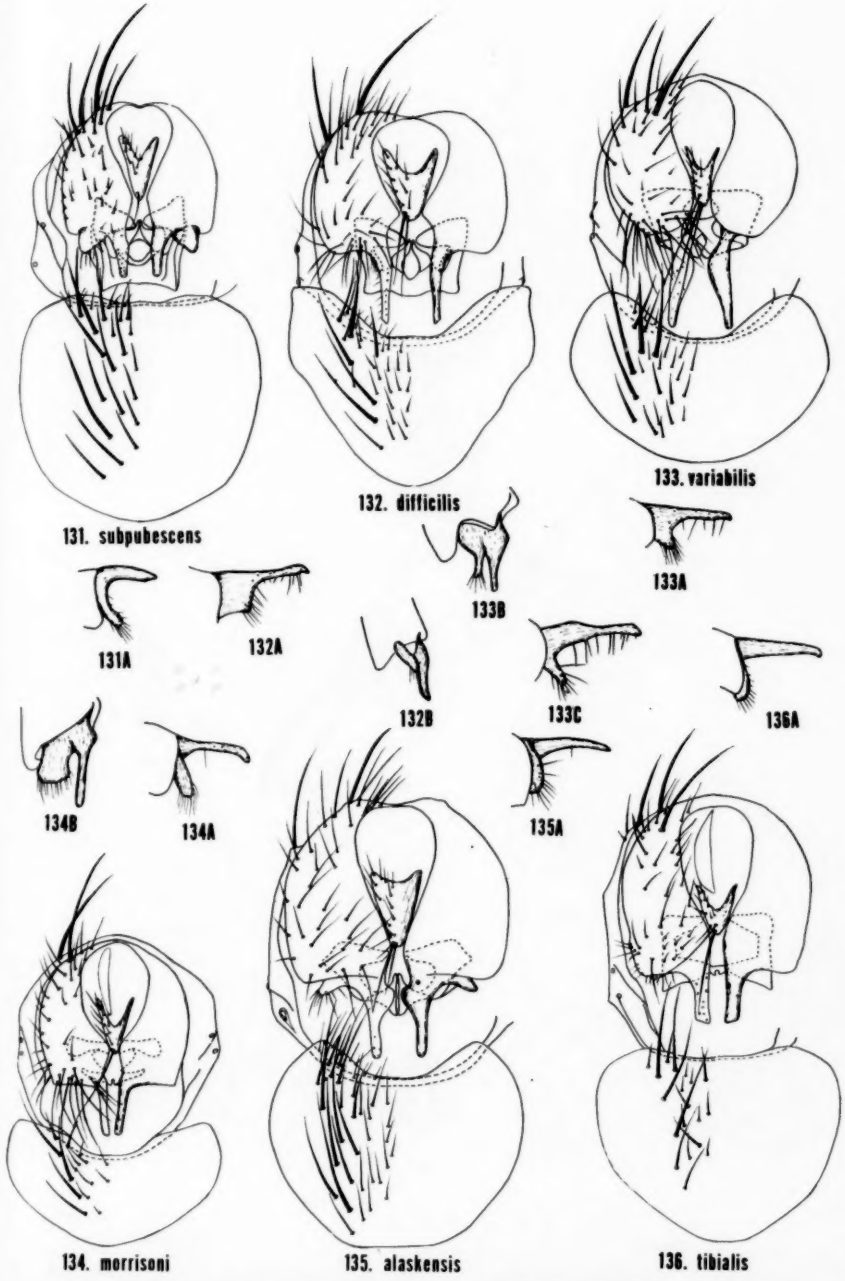
Figs. 96-107. Hypopygia of *Fannia* spp. 96, 103-107. Lateral views of hypopygia. 97-102. Posteroventral views of hypopygia and adjacent sclerites. 107A. Dorsomedial view of surstylus.



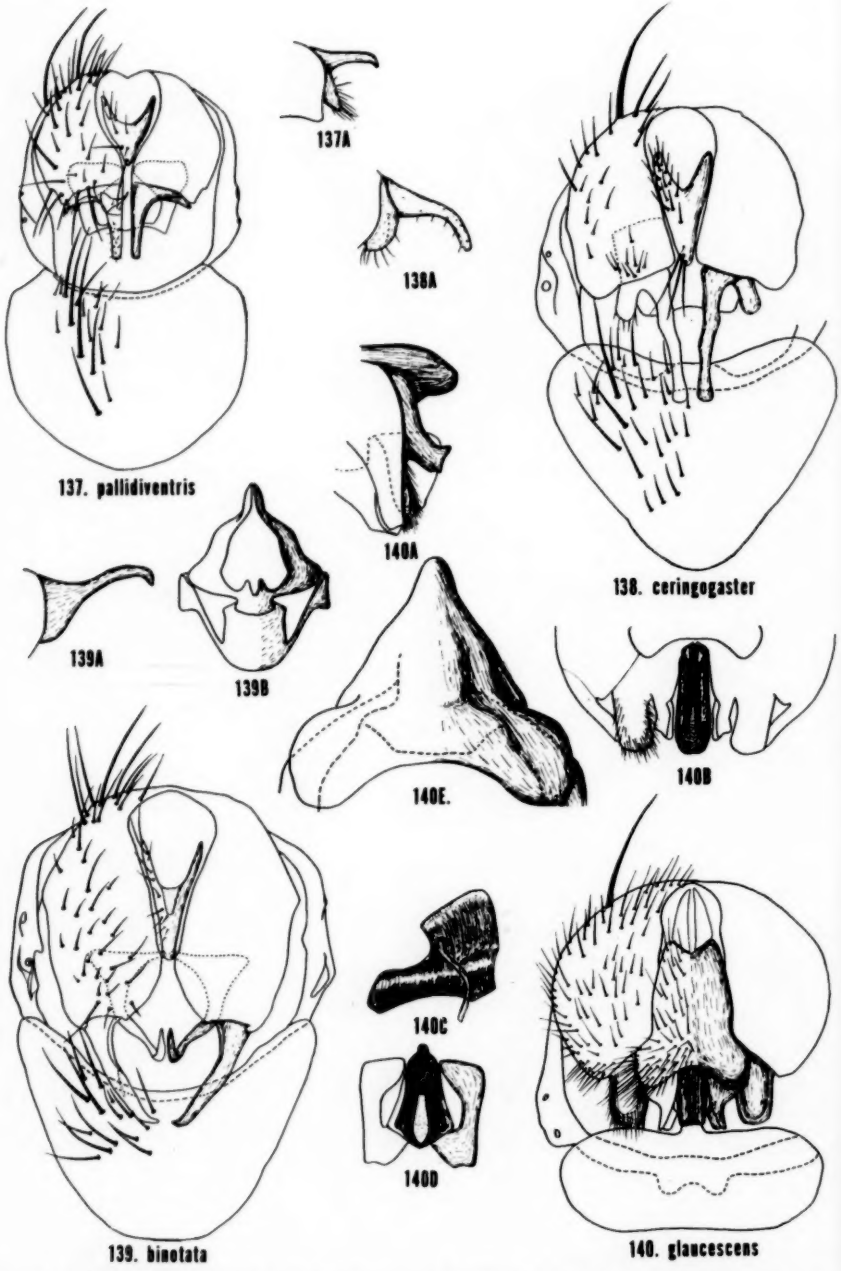
Figs. 108-118. Hypopygia of *Fannia* spp. 108, 115-118, 115A. Lateral views of hypopygia. 109-114, 109A, 110A. Posteroventral views of hypopygia and adjacent sclerites.



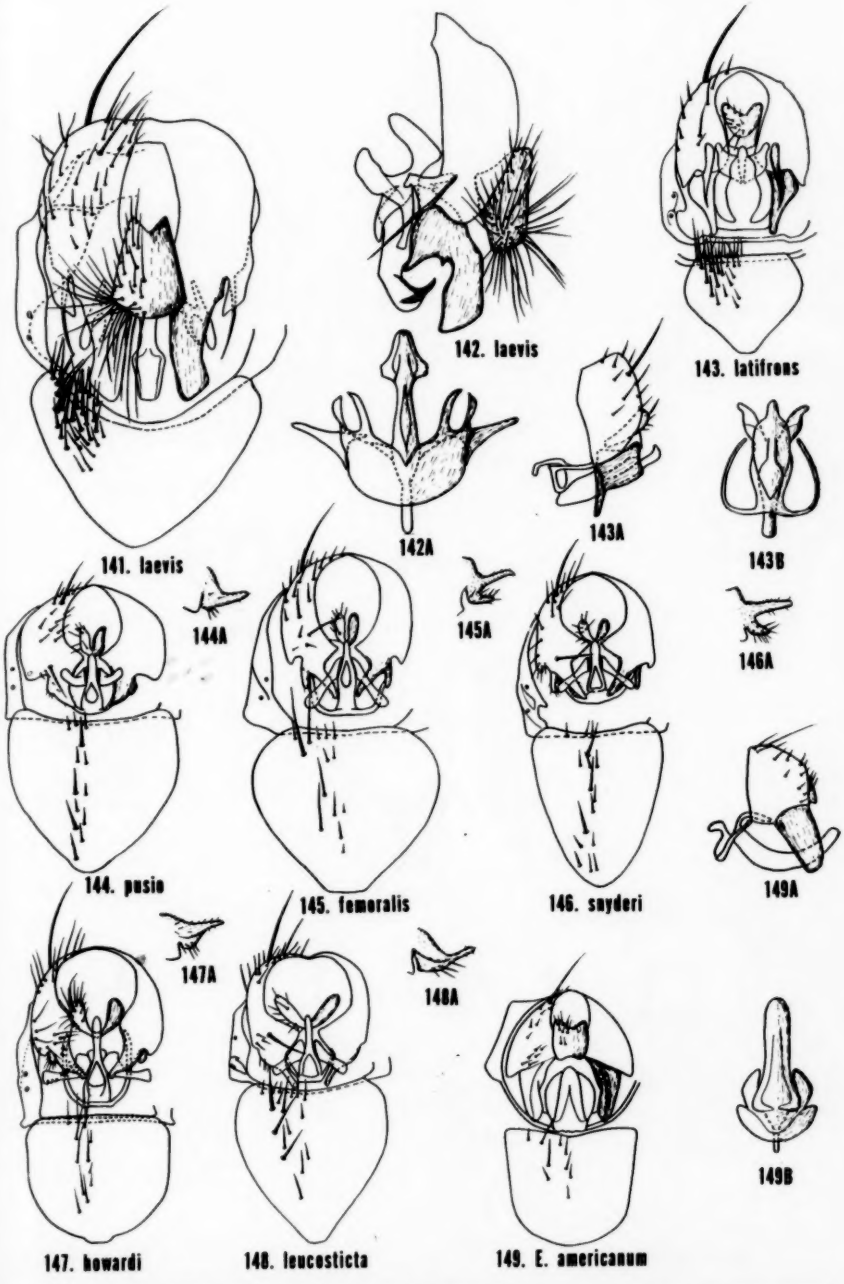
Figs. 119-130. Hypopygia of *Fannia* spp. 119-121, 125, 126, 129, 130. Posteroventral views of hypopygia and adjacent sclerites. 122-124, 127, 128. Lateral views of hypopygia. 129A, 129B, 130A. Lateral views of surstyli. 129C. Ventral view of ninth sternum. 129D. Posteroventral view of ninth sternum.



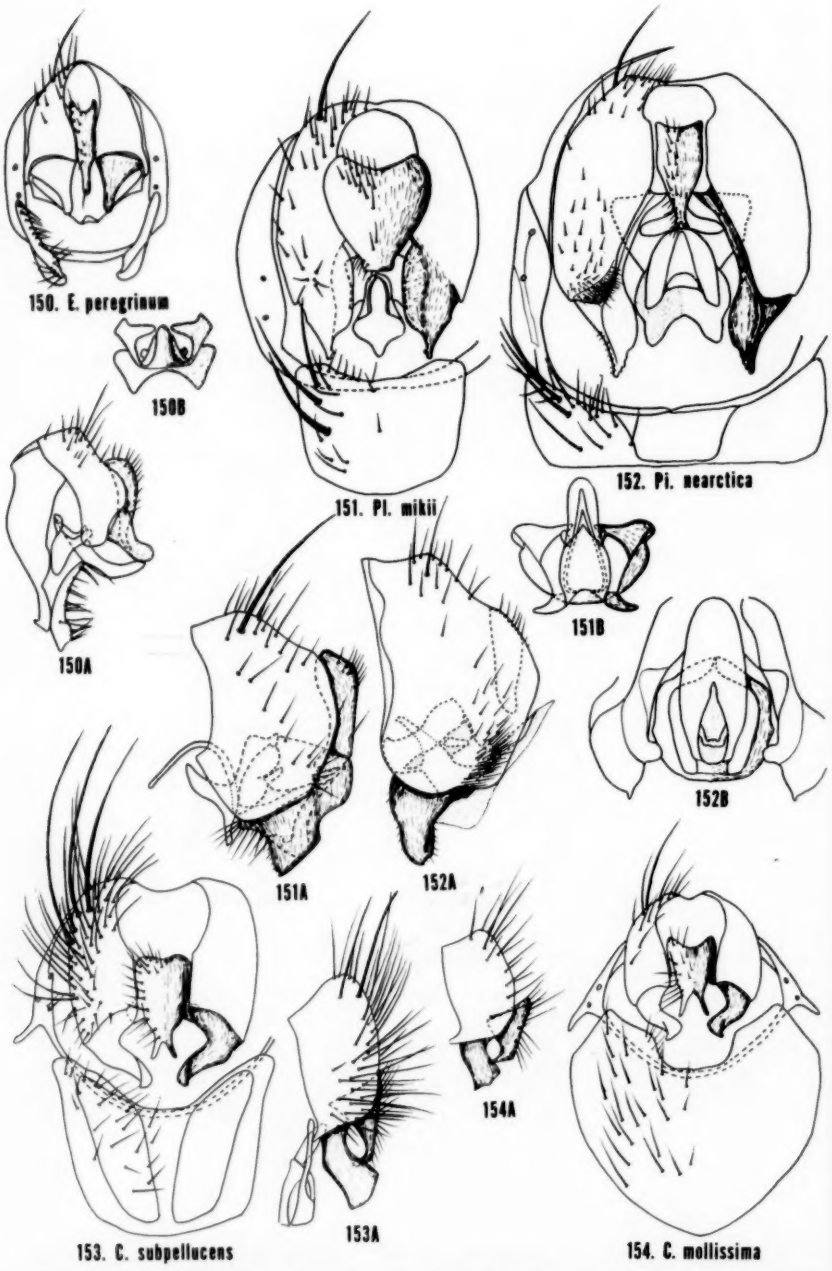
Figs. 131-136. Hypopygia of *Fannia* spp. 131-136. Posteroventral views of hypopygia and adjacent sclerites. 131A-136A. Lateral views of surstyli. 132B-134B. Lateroventral views of surstyli.



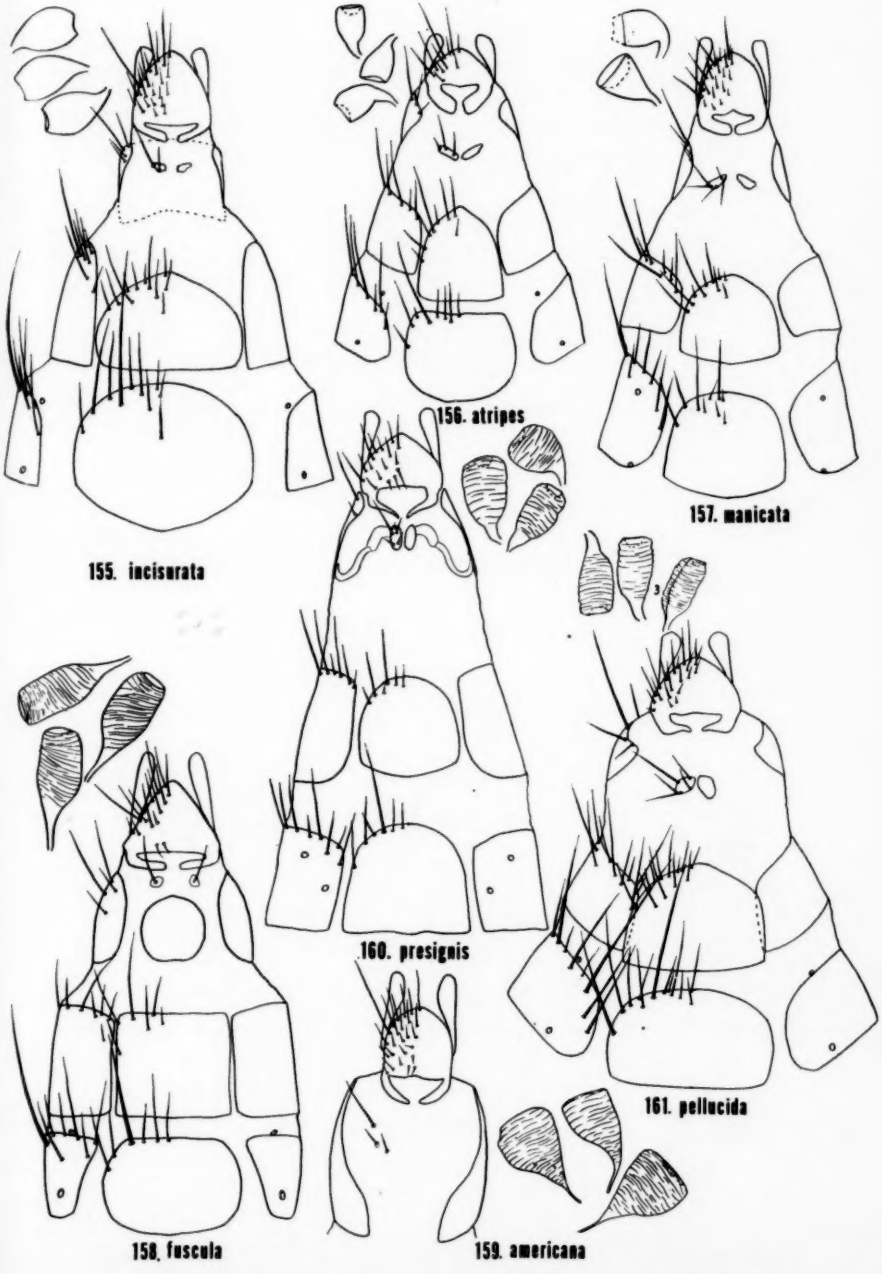
Figs. 137-140. Hypopygia of *Fannia* spp. 137-140. Posteroventral views of hypopygia and adjacent sclerites. 137A-140A. Lateral views of surstyli. 139B, 140D. Ventral views of ninth sternum. 140B. Posteroventral view of aedeagus. 140C. Lateral view of aedeagus. 140E. Ventral view of fifth sternum.



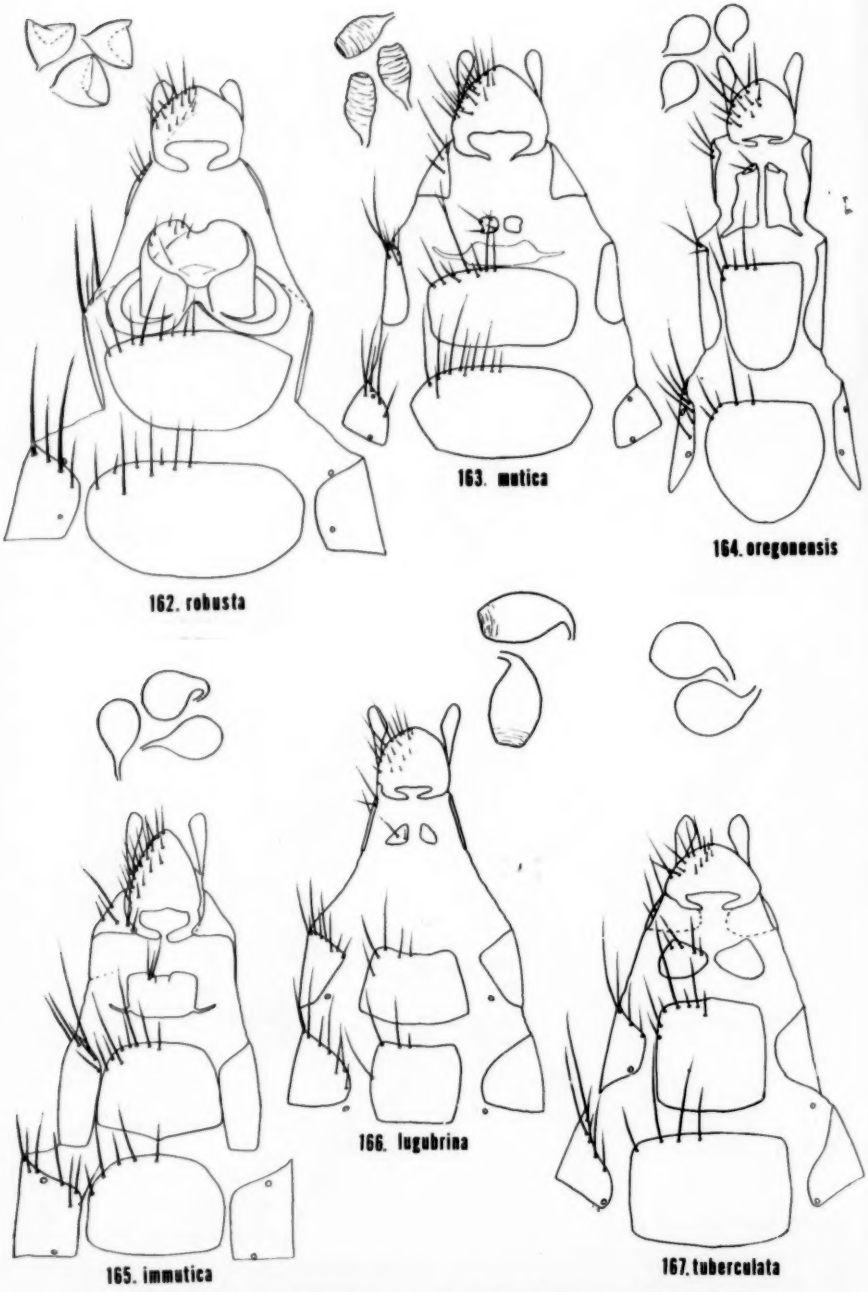
Figs. 141-149. Hypopygia of *Fannia* and *Euryomma* spp. 141, 143-149. Posteroventral views of hypopygia and adjacent sclerites. 142, 143A, 149A. Lateral views of hypopygia. 144A-148A. Lateral views of surstyli. 142A, 143B, 149B. Ventral views of ninth sterna.



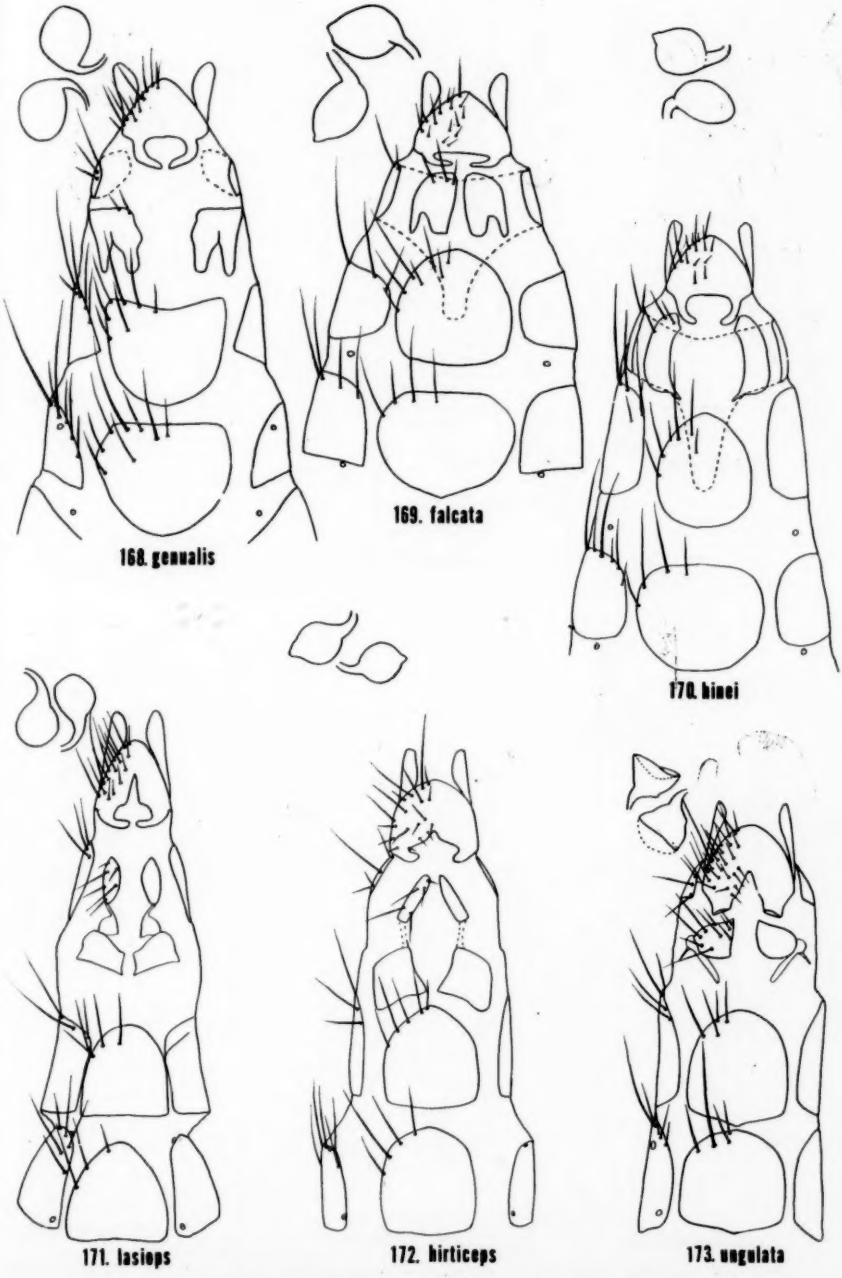
Figs. 150-154. Hypopygia of *Euryomma*, *Piezura*, *Platycoenosia*, and *Coelomyia* spp. 150-154. Posteroventral views of hypopygia and adjacent sclerites. 150A-154A. Lateral views of hypopygia. 150B-152B. Ventral views of ninth sterna.



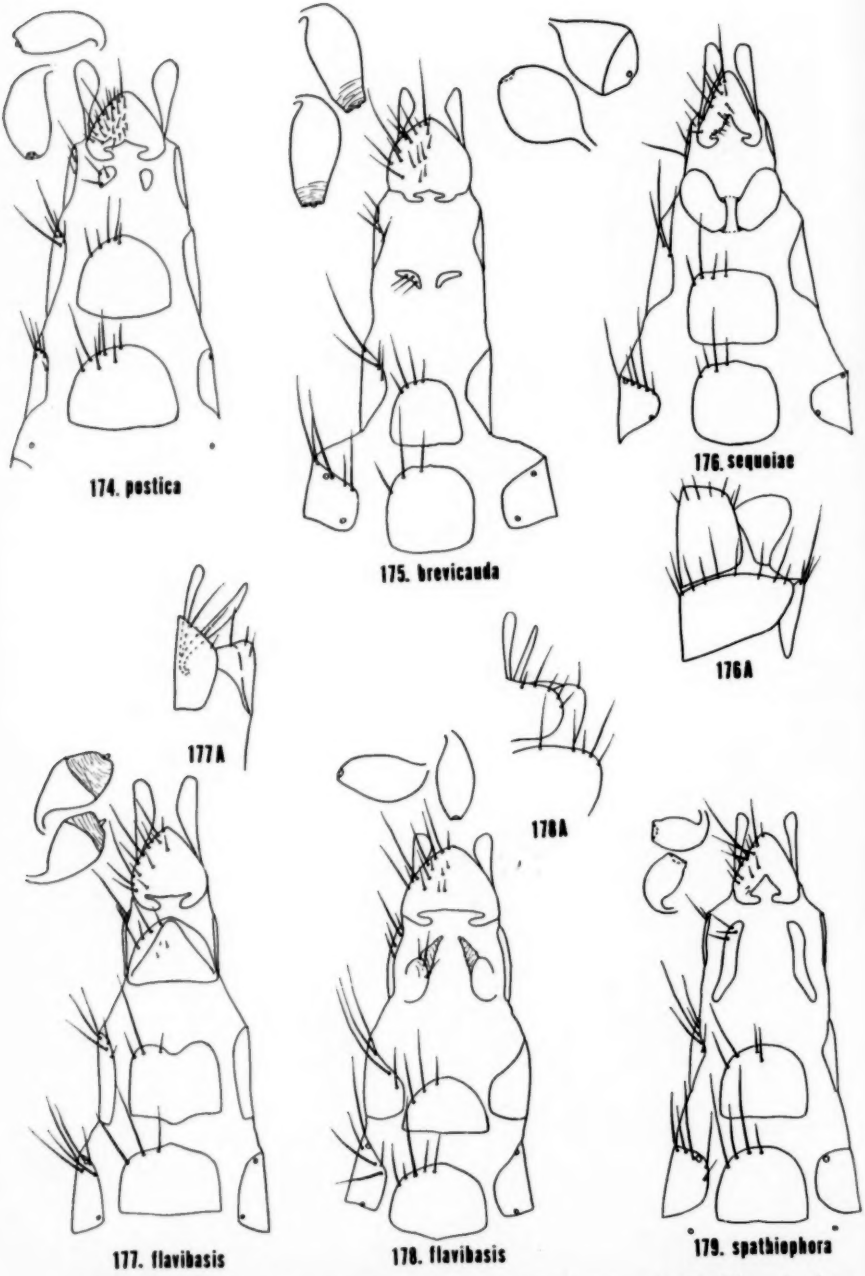
Figs. 155-161. Ovipositors and spermathecae of *Fannia* spp. Ventral views.



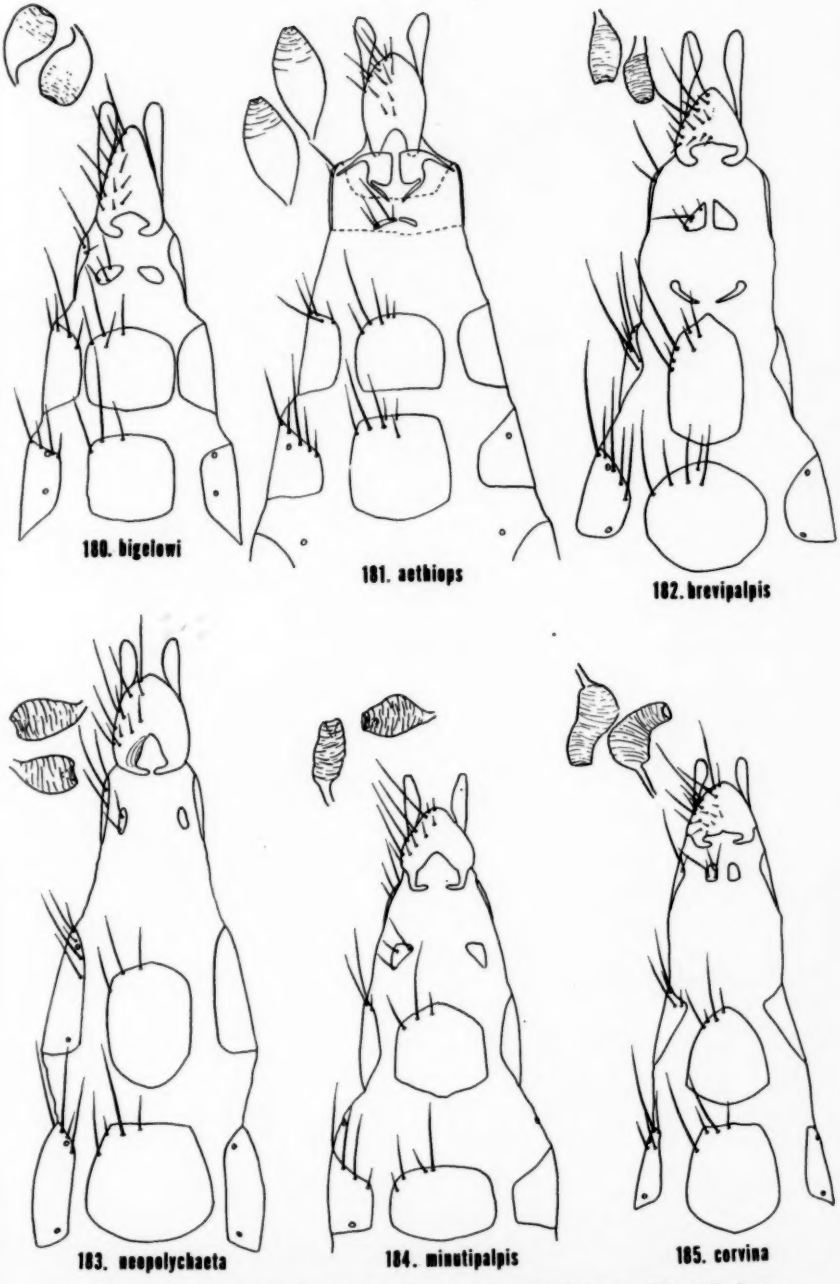
Figs. 162-167. Ovipositors and spermathecae of *Fannia* spp. Ventral views.



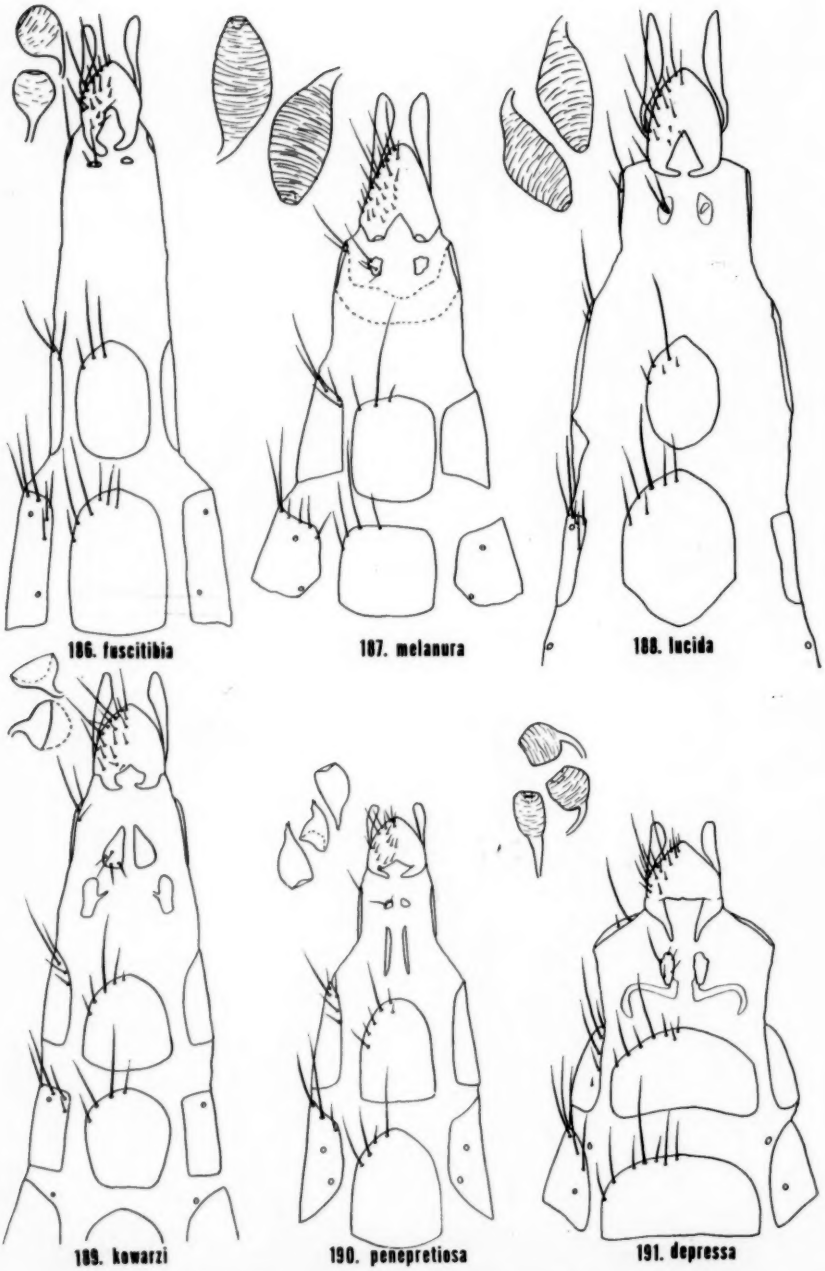
Figs. 168-173. Ovipositors and spermathecae of *Fannia* spp. Ventral views.



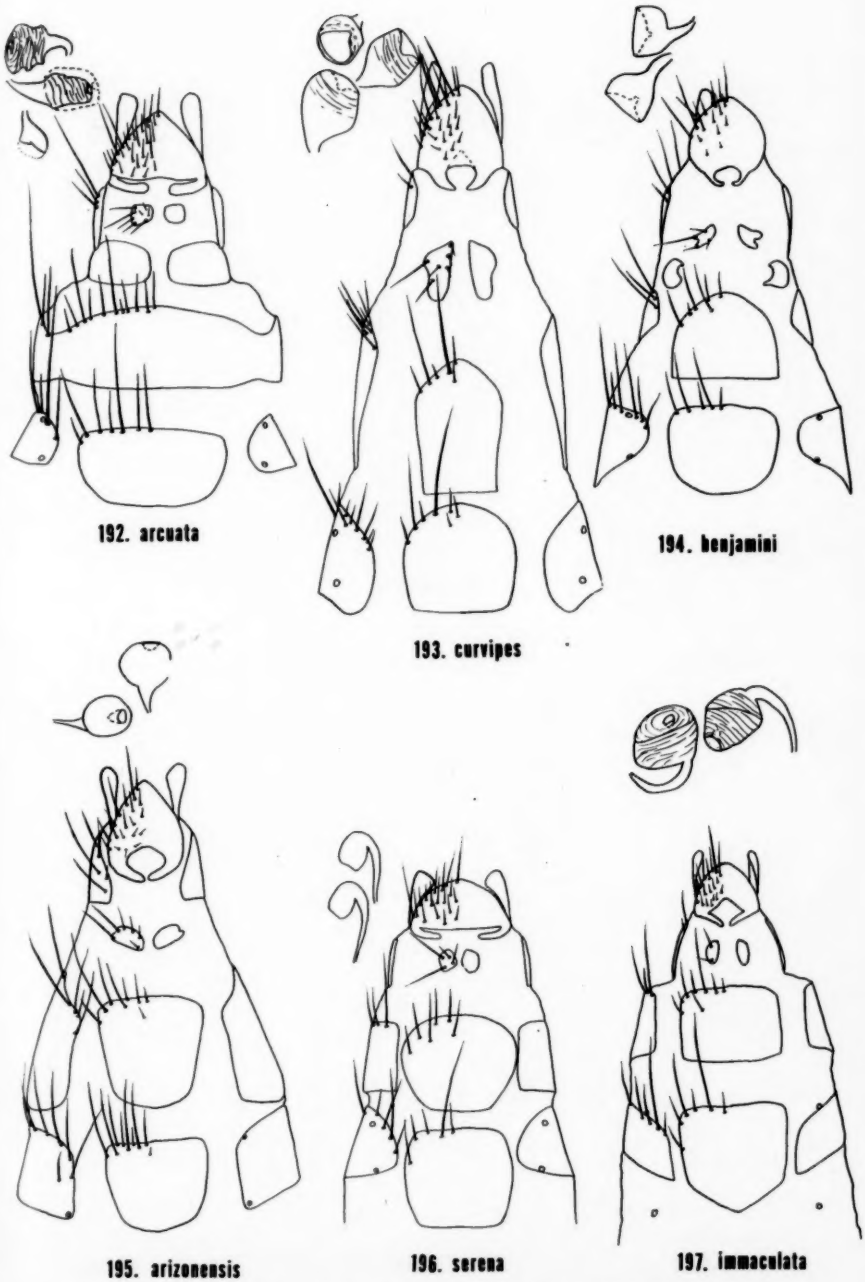
Figs. 174-179. Ovipositors and spermathecae of *Fannia* spp. 174-179. Ventral views. 176A-178A. Lateral views of apical segments.



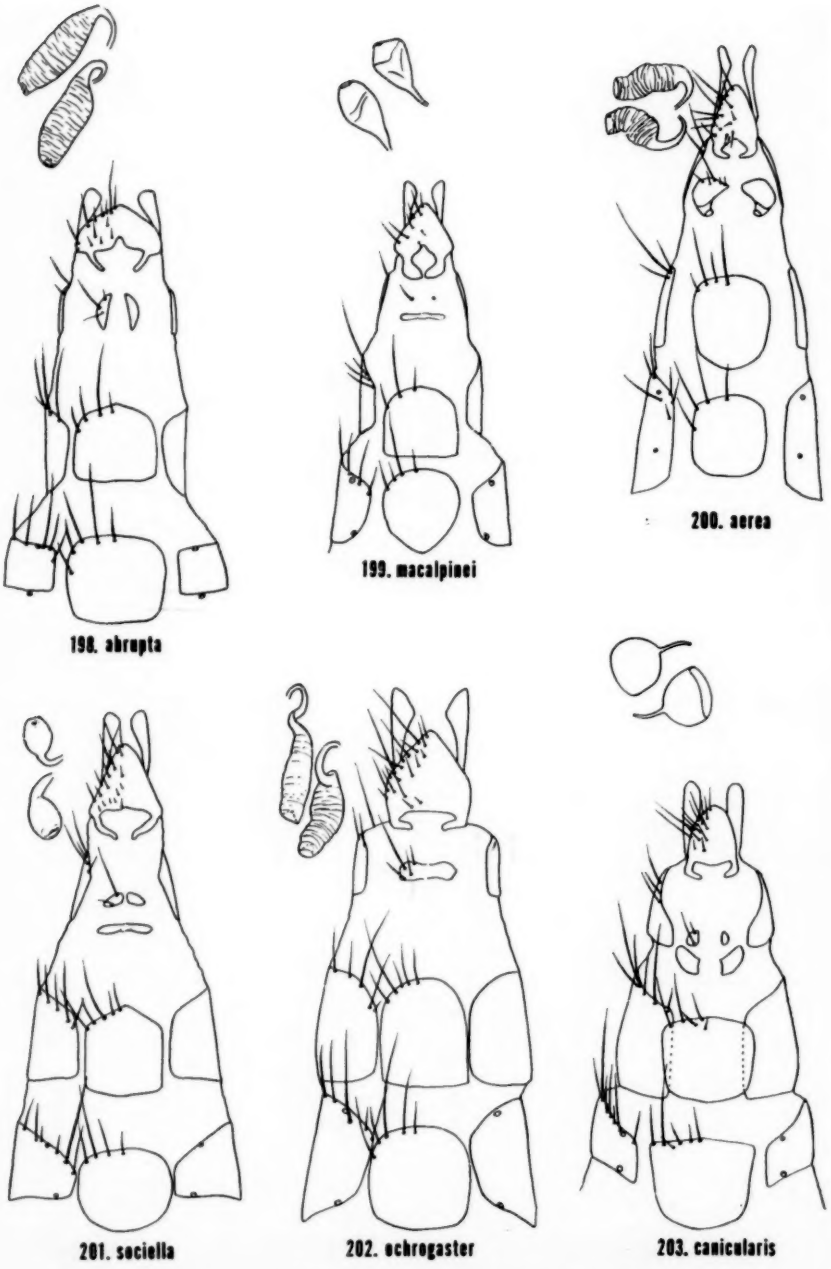
Figs. 180-185. Ovipositors and spermathecae of *Fannia* spp. Ventral views.



Figs. 186-191. Ovipositors and spermathecae of *Fannia* spp. Ventral views.



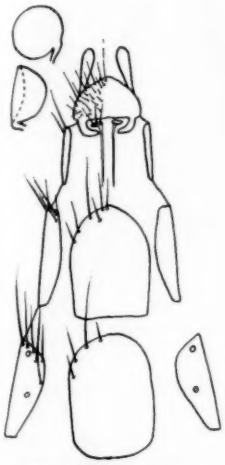
Figs. 192-197. Ovipositors and spermathecae of *Fannia* spp. Ventral views.



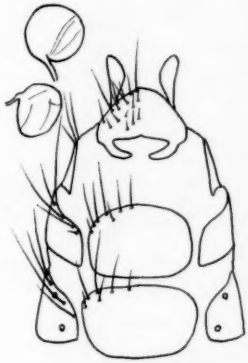
Figs. 198-203. Ovipositors and spermathecae of *Fannia* spp. Ventral views.

Figs. 204-208. Ovipositors and spermathecae of *Fannia* spp. Ventral views.

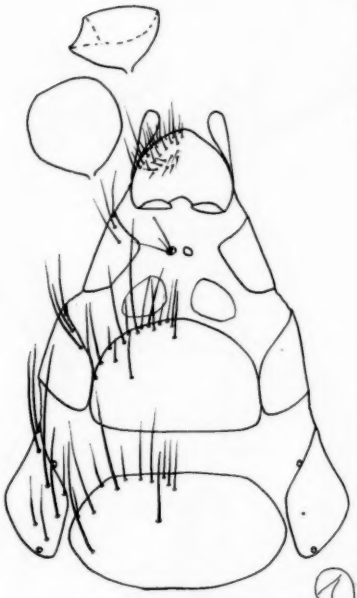
Figs. 209-216. Ovipositors and spermathecae of *Fannia* spp. Ventral views.



217. E. peregrinum



218. E. americanum

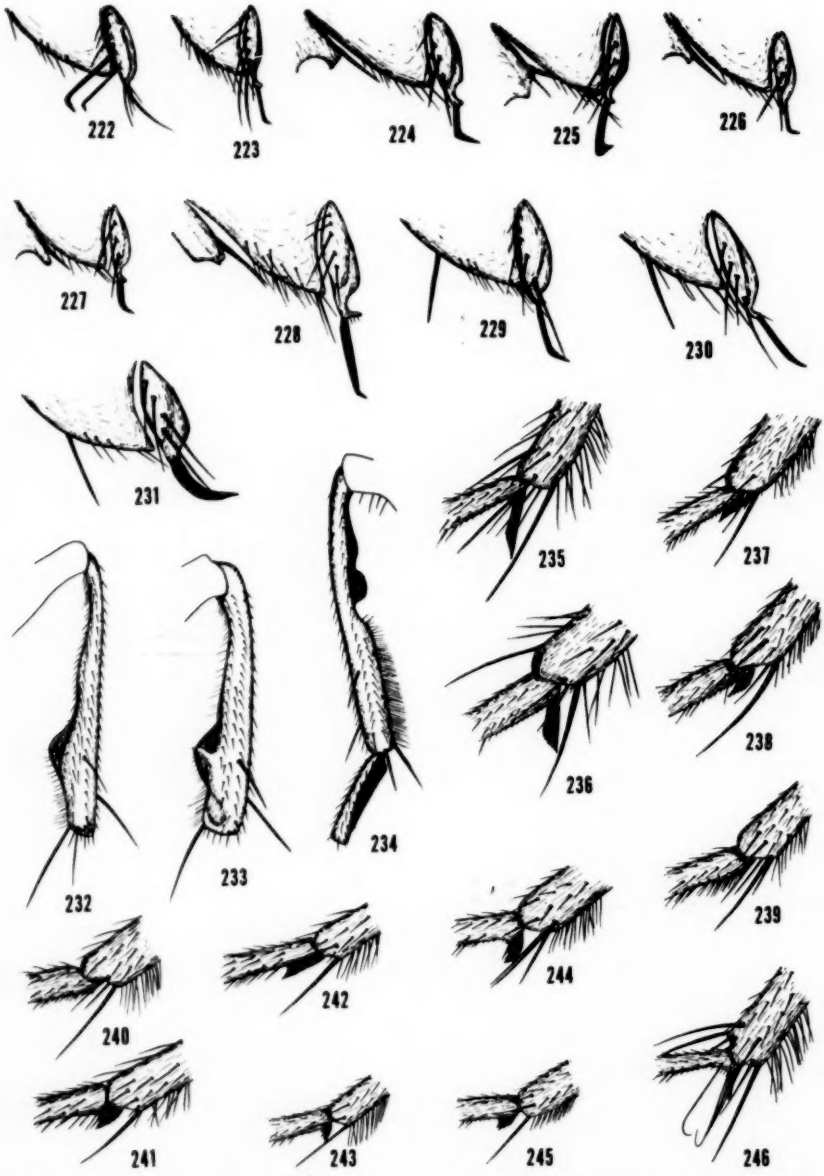


219. Pl. mikii

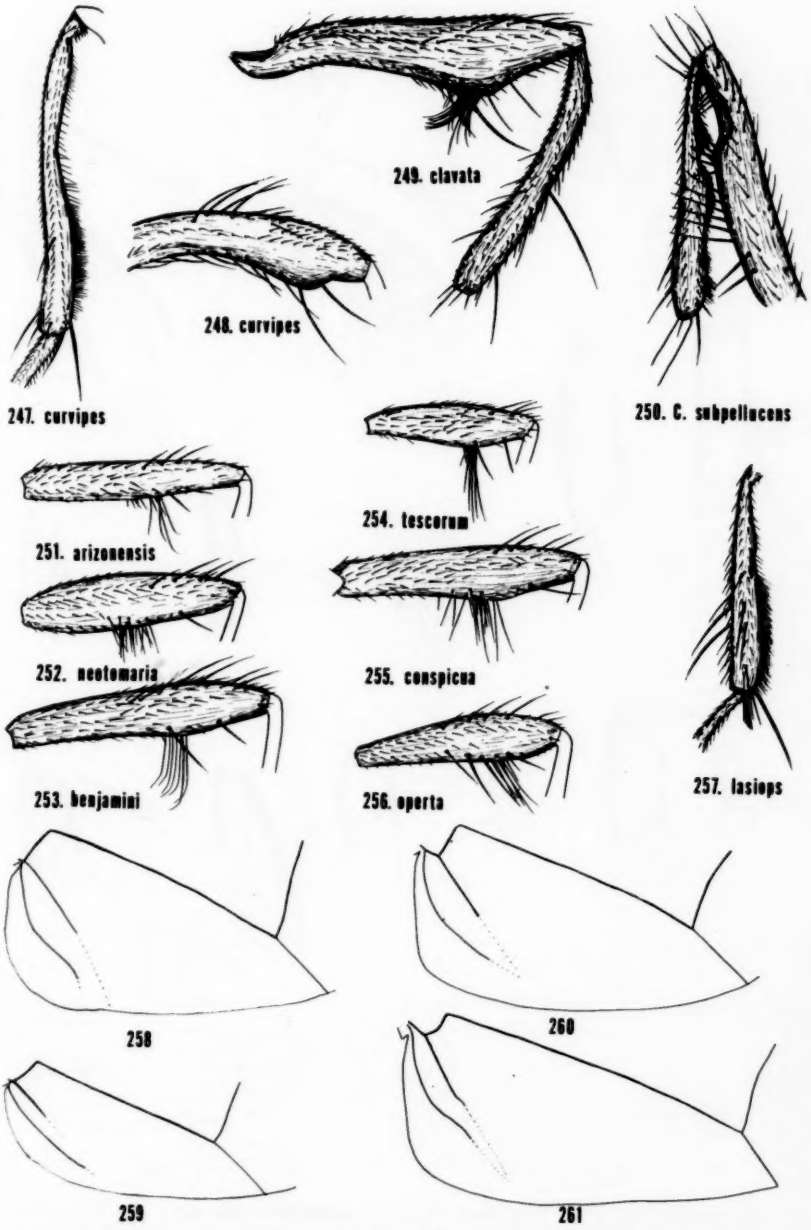
220. C. mollissima

221. C. subpellucens

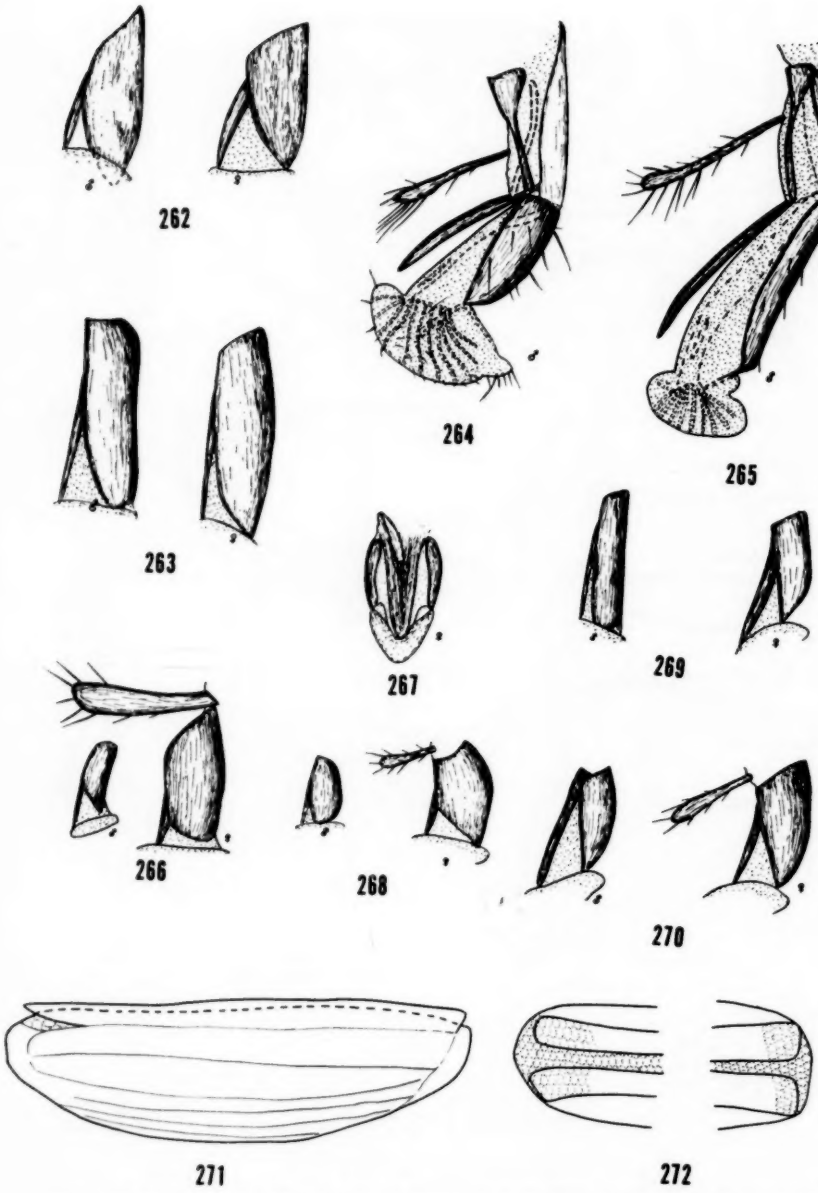
Figs. 217-221. Ovipositors and spermathecae of *Euryomma*, *Platycoenosia*, and *Coelomyia* spp. Ventral views.



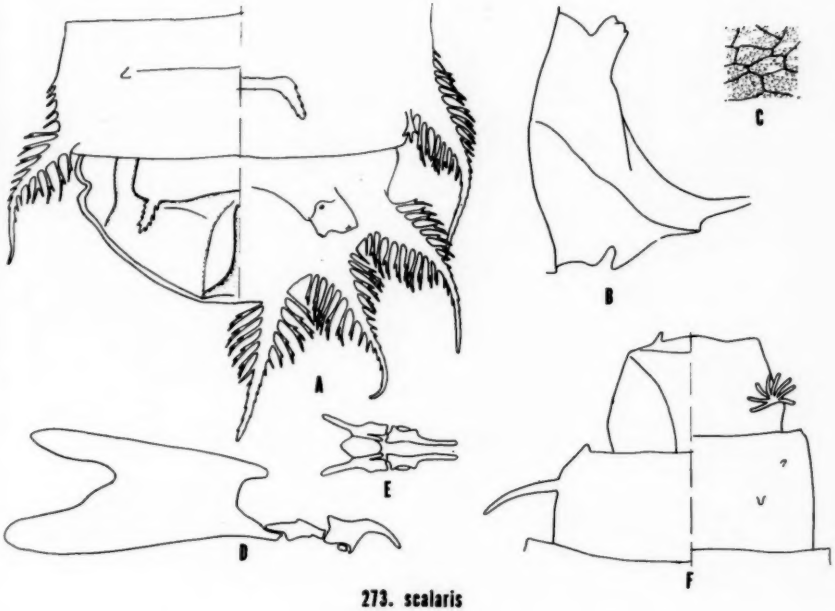
Figs. 222-246. *Fannia* spp. 222-231. Lateral views of ventral portions of sternopleura: 222, *scalaris;* 223, *atripes;* 224, *ciliatissima;* 225, *columbiana;* 226, *enotahensis;* 227, *monilis;* 228, *manicata;* 229, *americana;* 230, *fuscula;* 231, *pellucida.* 232-234. Left mid tibiae: 232, *coracina* (anterior view); 233, *scalaris* (anterior view); 234, *tuberculata* (posterior view). 235-246. Left mid metatarsi and apices of mid tibiae (posterior views): 235, *lasiops;* 236, *ungulata;* 237, *brooksi;* 238-239, *aethiops;* 240, *postica;* 241, *flavibasis;* 242, *sequoiae;* 243, *tundrarum;* 244, *bigelowi;* 245, *scyphocerca;* 246, *spathiophora.*



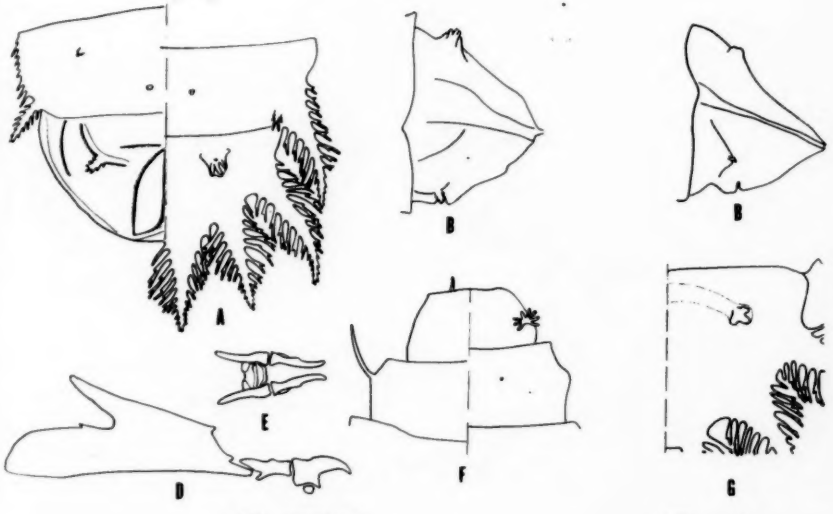
Figs. 247-261. 247-257. Legs of *Fannia* and *Coelomyia* spp.: 247, Mid tibia, posterior view. 248, Hind femur, anterior view. 250, Mid femur and tibia, posterior view. 251-256. Hind femora, anterior views. 257. Mid tibia and metatarsus, posterior view. 258-261. Anal areas of wings: 258. *Azelia triquetra.* 259. *Euryomma peregrinum.* 260. *Fannia fuscitibia.* 261. *Fannia canicularis.*



Figs. 262-272. 262-270. Mouthparts of *Fannia* and *Coelomyia* spp.: 262. Thecae of *F. glaucescens*, lateral views. 263. Thecae of *F. tuberculata*, lateral views. 264. Proboscis of *F. ungulata*, lateral view. 265. Proboscis of *F. lugubrina*, lateral view. 266. Thecae of *F. fuscitibia*, lateral views. 267. Anterior view and 268, lateral views of thecae of *F. brevipalpis*. 269. Thecae of *C. mollissima*, lateral views. 270. Thecae of *C. subpellucens*, lateral views. 271-272. Egg of *Fannia canicularis*: 271. Lateral view. 272. Dorsal views of anterior and posterior ends.



273. scalaris



274. enotahensis

275. manicata

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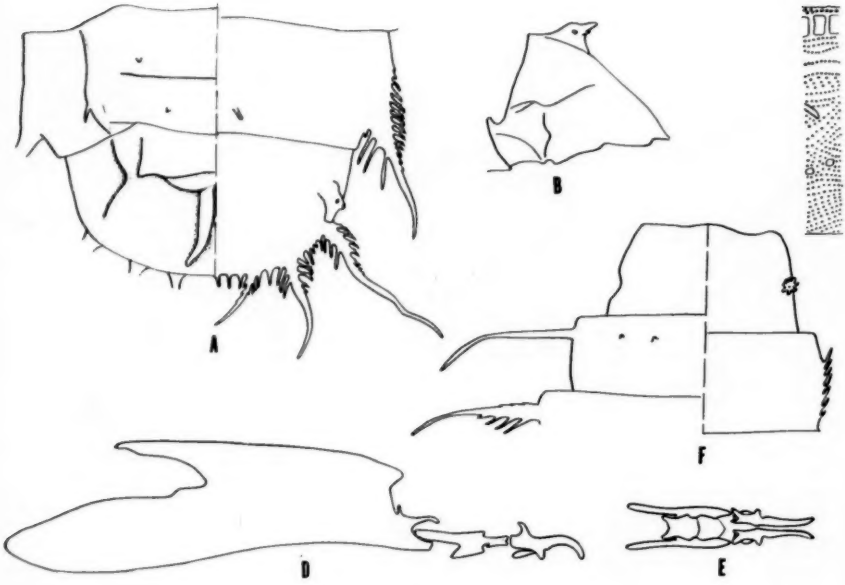
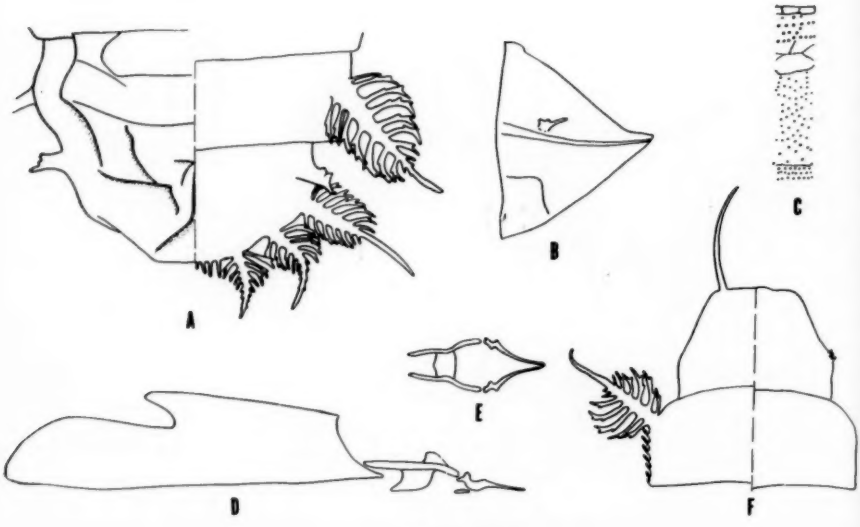


276. genualis



277. brevipalpis

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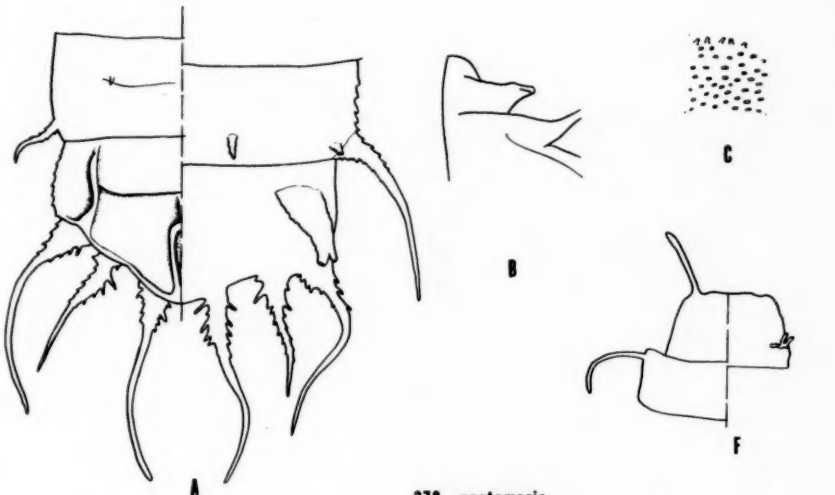
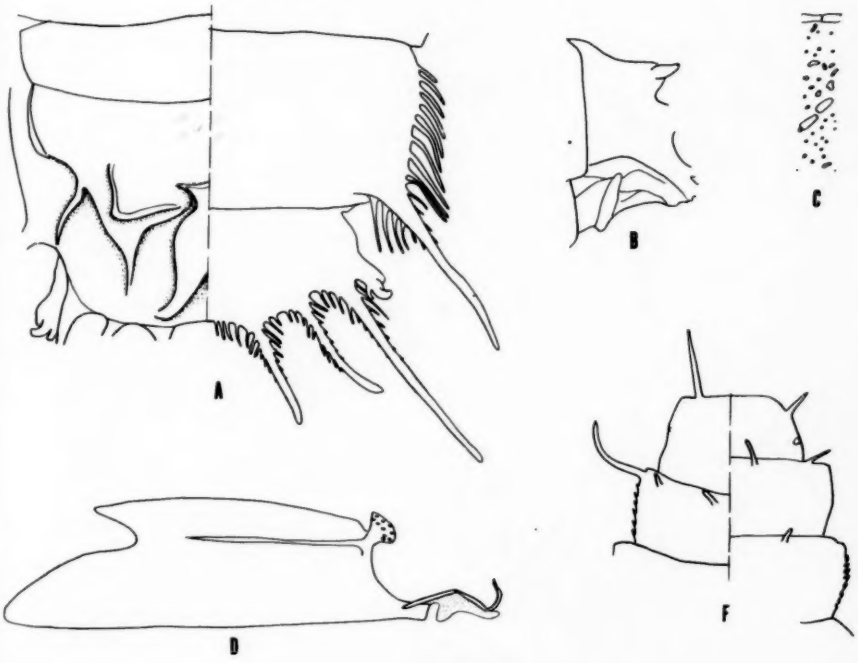


278. neotomaria



279. macalpinei

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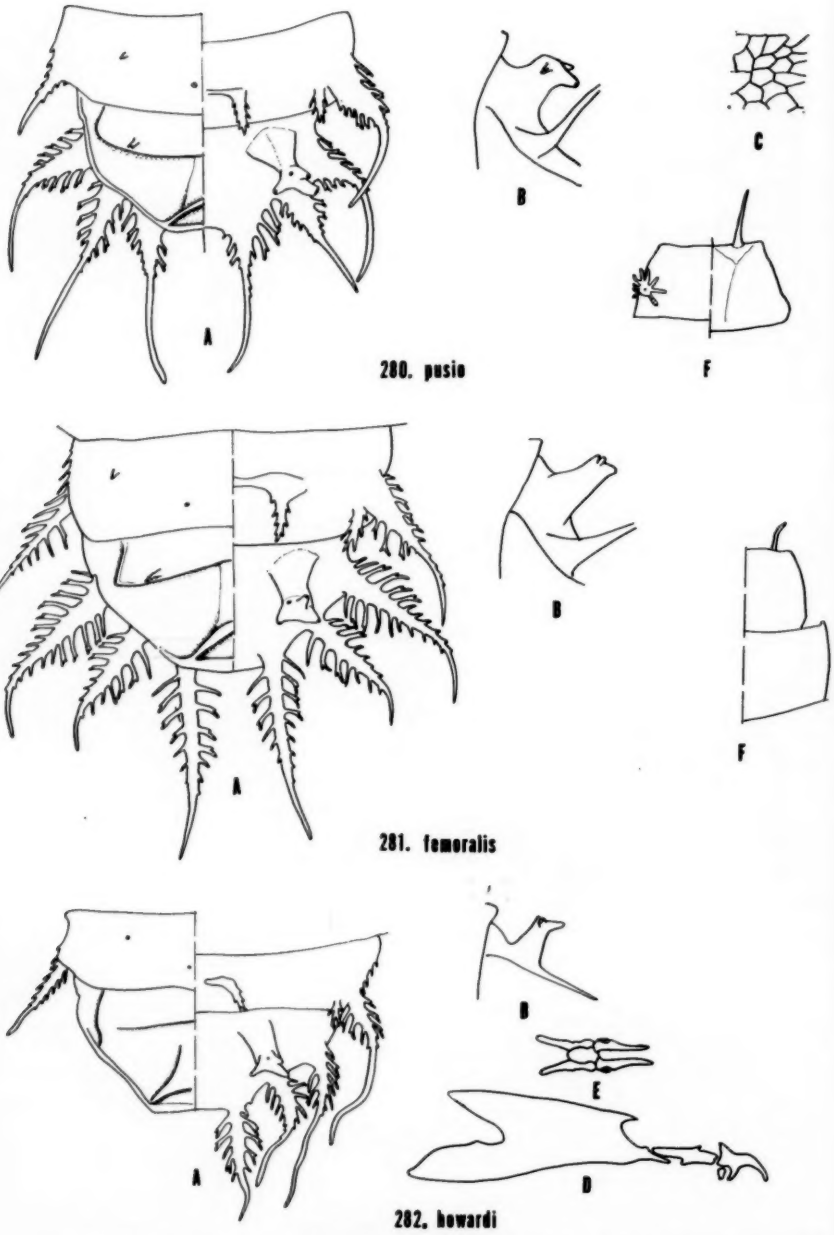

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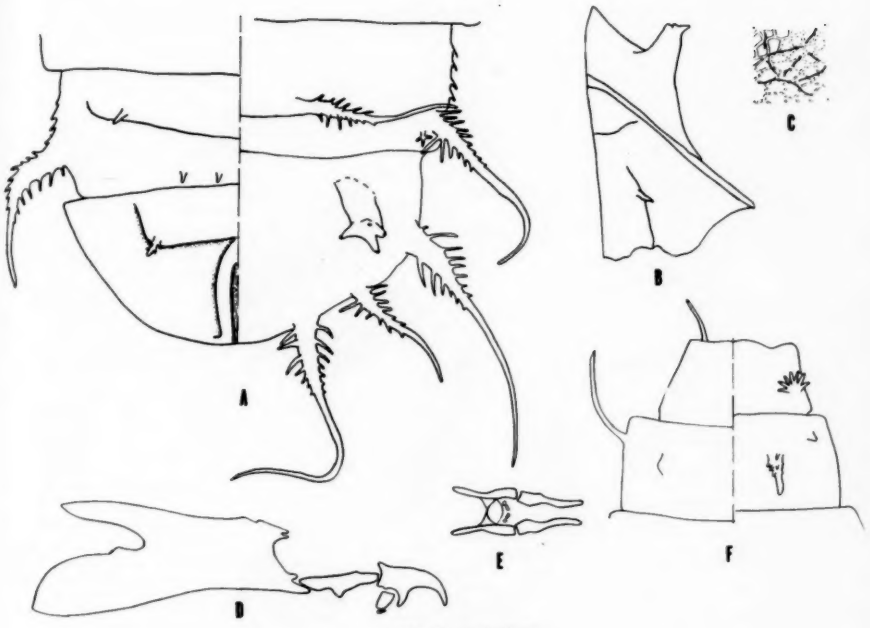
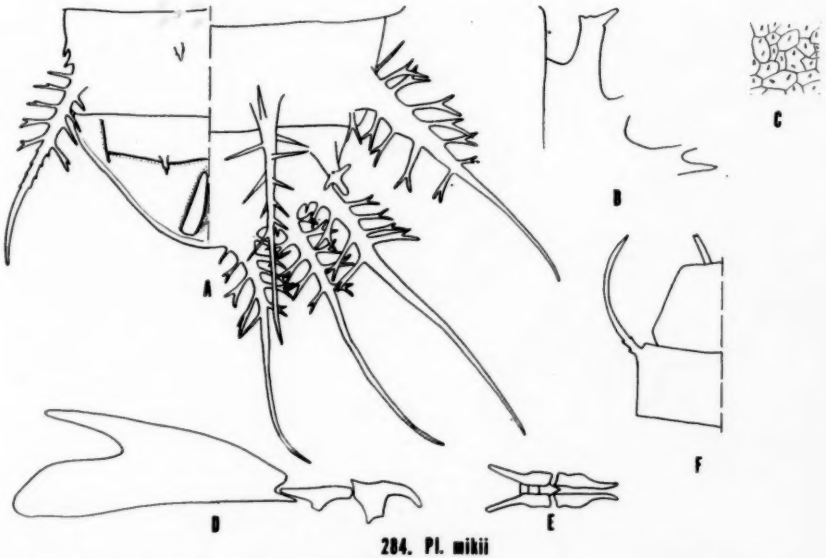


283. F. canicularis



284. Pl. mikii

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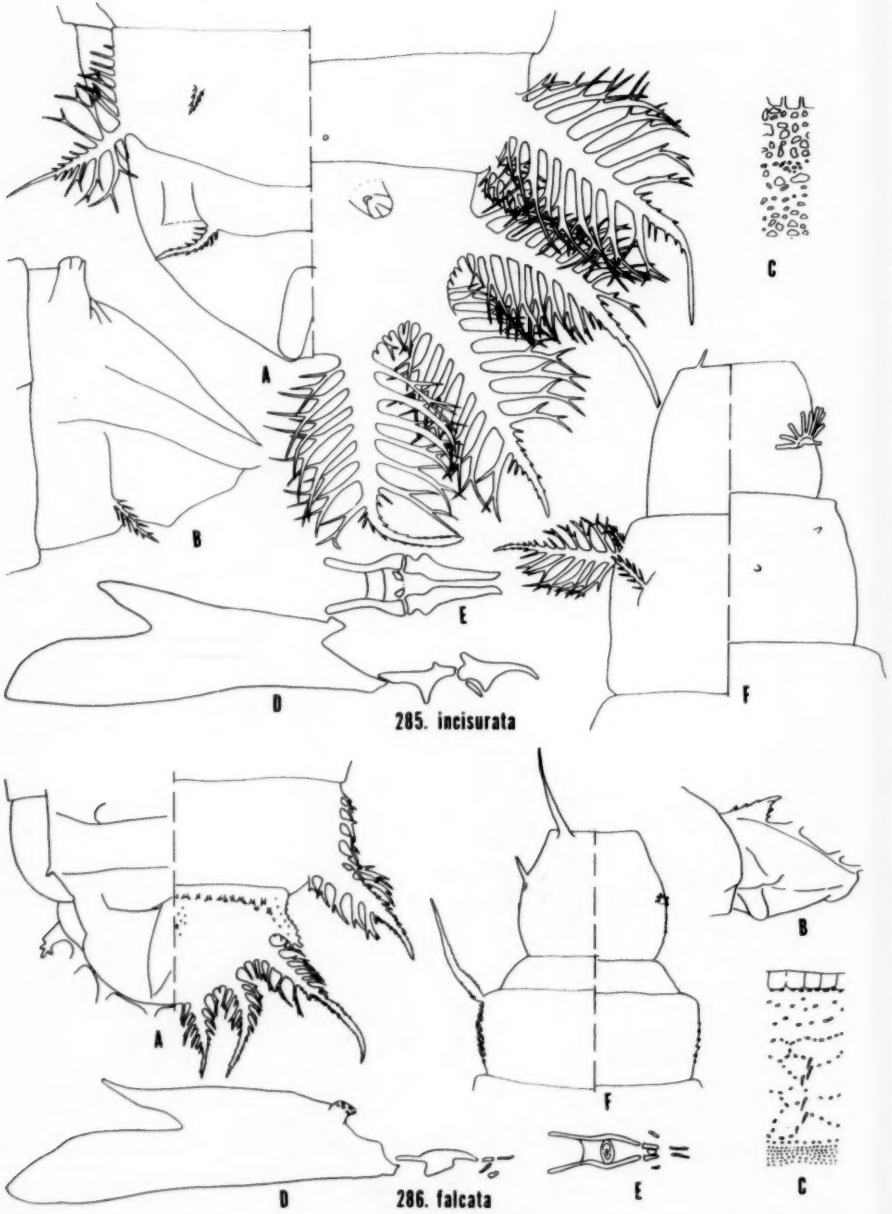

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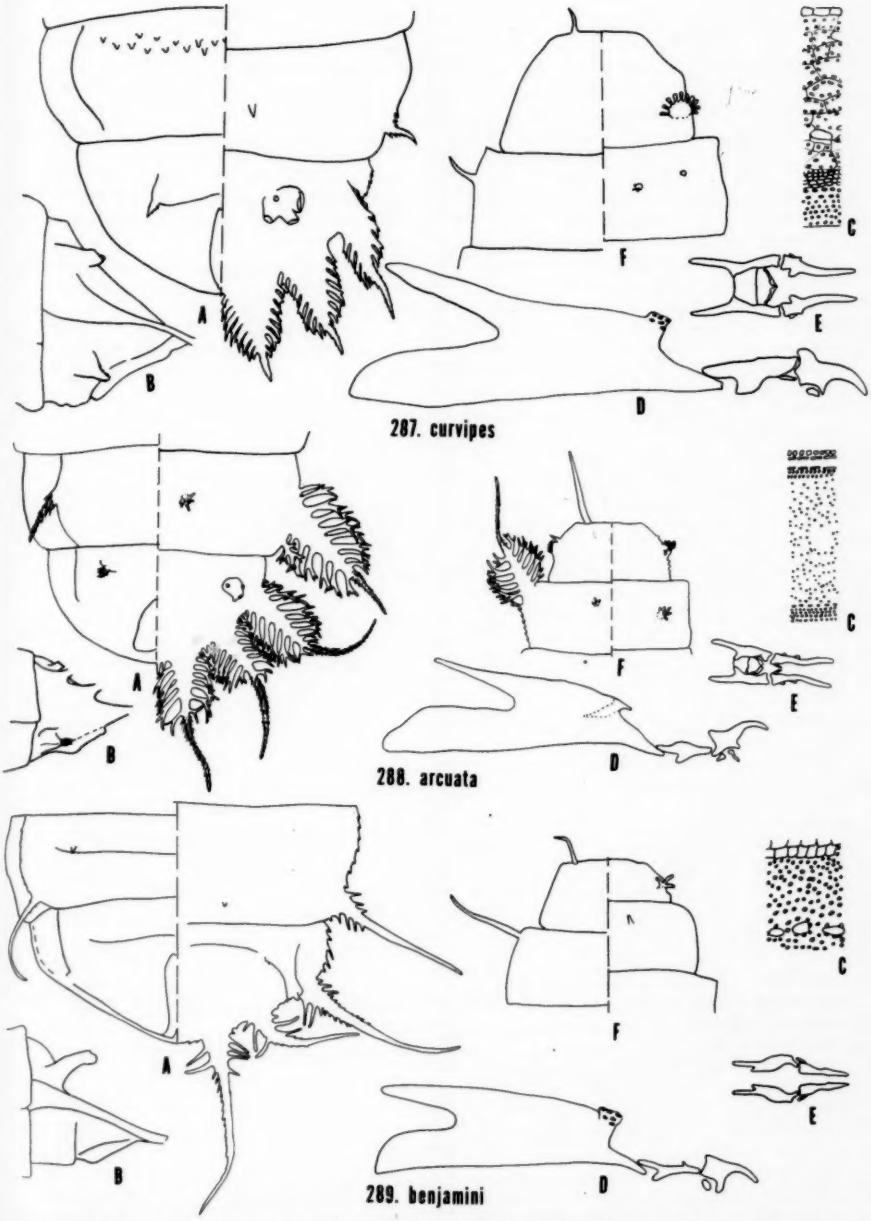

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